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Proceedings of the Regional Peer Review on the Evaluation of Proposed Ecologically and Biologically Significant Areas in Marine Waters of British Columbia

February 7 – 8, 2012
Nanaimo, British Columbia

Meeting Chairpersons: Janelle Curtis and Ian Perry

Editors: Sarah Davies and Miriam O

Compte rendu de l'examen par les pairs sur l'Évaluation des propositions de zones d'importance écologique et biologique dans les eaux marines de la Colombie-Britannique

Les 7 et 8 février 2012
Nanaimo (Colombie-Britannique)

Présidents de la réunion : Janelle Curtis et Ian Perry

Rédactrices : Sarah Davies et Miriam O

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Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings include research recommendations, uncertainties, and the rationale for decisions made by the meeting. Proceedings also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

Avant-propos

Le présent compte rendu a pour but de documenter les principales activités et discussions qui ont eu lieu au cours de la réunion. Il contient des recommandations sur les recherches à effectuer, traite des incertitudes et expose les motifs ayant mené à la prise de décisions pendant la réunion. En outre, il fait état de données, d'analyses ou d'interprétations passées en revue et rejetées pour des raisons scientifiques, en donnant la raison du rejet. Bien que les interprétations et les opinions contenues dans le présent rapport puissent être inexactes ou propres à induire en erreur, elles sont quand même reproduites aussi fidèlement que possible afin de refléter les échanges tenus au cours de la réunion. Ainsi, aucune partie de ce rapport ne doit être considérée en tant que reflet des conclusions de la réunion, à moins d'indication précise en ce sens. De plus, un examen ultérieur de la question pourrait entraîner des changements aux conclusions, notamment si l'information supplémentaire pertinente, non disponible au moment de la réunion, est fournie par la suite. Finalement, dans les rares cas où des opinions divergentes sont exprimées officiellement, celles-ci sont également consignées dans les annexes du compte rendu.

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SUMMARY

These Proceedings summarize the relevant discussions and key conclusions that resulted from a Fisheries and Oceans Canada (DFO), Canadian Science Advisory Secretariat (CSAS) Regional Peer Review (RPR) meeting on February 7th and 8th, 2012 at the Pacific Biological Station in Nanaimo, B.C. Four working papers were reviewed at this meeting; two of the papers (published in 2006) presented data and analyses relevant to the PNCIMA ecoregion (northern shelf area) while the other two papers (unpublished) related to the Strait of Georgia and the west coast of Vancouver Island (southern shelf area) ecoregions from various organizations and sectors, including: Fisheries & Oceans Canada, Parks Canada, Environment Canada, the Haida Oceans Technical Team, Cowichan Tribes, Marine Planning Partnership (MaPP), Georgia Strait Alliance, University of British Columbia, British Columbia Marine Conservation Analysis, and the Pacific Salmon Foundation.

The conclusions and advice resulting from this review will be provided in the form of a Science Advisory Report providing advice to inform DFO planning in the Pacific region will be made publicly available on the CSAS Science Advisory web site at http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm.

SOMMAIRE

Le présent compte rendu résume l'essentiel des discussions et conclusions de la réunion régionale consultative de Pêches et Océans Canada (MPO) et du Secrétariat canadien de consultation scientifique (SCCS) qui a eu lieu les 7 et 8 février à la station biologique du Pacifique de Nanaimo, en Colombie-Britannique. Quatre documents de travail ont été examinés lors de cette réunion; deux des documents (publiés en 2006) présentaient des données et des analyses qui relevaient de l'écorégion de la zone de gestion intégrée de la côte nord du Pacifique (ZGICNP) (écorégion du plateau nord) tandis que les deux autres documents (non publiés) portaient sur les écorégions du détroit de Georgie et de la côte ouest de l'île de Vancouver (écorégion du plateau sud) faisaient partie de plusieurs organisations et secteurs, entre autres, Pêches et Océans Canada, Parcs Canada, Environnement Canada, l'équipe technique sur les océans Haïda, tribus Cowichan, le Marine Planning Partnership, la Georgia Strait Alliance, l'Université de la Colombie-Britannique, la British Columbia Marine Conservation Analysis et la Fondation du saumon du Pacifique.

Les conclusions et avis découlant de cet examen seront présentés sous la forme d'un avis scientifique afin d'orienter la planification du MPO dans la région du Pacifique seront rendus publics sur le site Web des avis scientifiques du Secrétariat canadien de consultation scientifique (SCCS) à http://www.dfo-mpo.gc.ca/csas-sccs/index-fra.htm.

INTRODUCTION

A Fisheries and Oceans Canada (DFO) Canadian Science Advisory Secretariat (CSAS), Regional Peer Review (RPR) meeting was held on February 7th and 8th, 2012 at the Pacific Biological Station in Nanaimo, British Columbia (B.C.) to review four documents that describe the methodology and identification of ecologically and biologically significant areas for the Pacific region.

The Terms of Reference (TOR) for the science review (Appendix A) were developed in response to a request for advice from DFO's Oceans program. Notifications of the science review and conditions for participation were sent to representatives with relevant expertise from First Nations, commercial and recreational fishing sectors, environmental non-governmental organizations and academia.

The following working papers (WP) were prepared and made available to meeting participants prior to the meeting (summaries provided in Appendix B):

Clarke, C.L., and Jamieson, G.S. 2006a. Identification of ecologically and biologically significant areas in the Pacific North Coast Integrated Management Area: Phase I – Identification of important areas. Can. Tech. Rep. Fish. Aquat. Sci. 2678: 59 p.

Clarke, C.L., and Jamieson, G.S. 2006b. Identification of ecologically and biologically significant areas in the Pacific North Coast Integrated Management Area: Phase II – Final Report. Can. Tech. Rep. Fish. Aquat. Sci. 2686: v + 25 p.

Jamieson, G. and Levesque, C. Identification of ecologically and biologically significant areas in the Strait of Georgia and off the west coast of Vancouver Island: Phase I – Identification of Important Areas. CSAP Working Paper 2011/P51.

Jamieson, G. and Levesque, C. Identification of ecologically and biologically significant areas on the west coast of Vancouver Island and the Strait of Georgia, and in some nearshore areas on the North Coast: Phase II – Designation of EBSAs. CSAP Working Paper 2011/P58

To minimize confusion, 2006 papers will be referred to as those related to the PNCIMA area and 2011 papers will be referred to as those relating to the Strait of Georgia (SoG) and west coast Vancouver Island (WCVI) ecoregions, although the 2011 papers do include the nearshore areas of the PNCIMA region.

The meeting Chairs, Ian Perry and Janelle Curtis, welcomed participants, reviewed the role of CSAS in the provision of peer-reviewed advice, and gave a general overview of the CSAS process. The Chairs discussed the role of participants, the purpose of the various RAP publications (Science Advisory Report, Proceedings and Research Document), and the definition and process around achieving consensus decisions and advice. Everyone was invited to participate fully in the discussion and to contribute knowledge to the process, with the goal of delivering scientifically defensible conclusions and advice. As such, the participants of this meeting will be referred to in this document as the review committee. It was confirmed with participants that all had received copies of the Terms of Reference and working papers.

The Chair reviewed the Agenda (Appendix C) and the Terms of Reference for the meeting, highlighting the objectives and identifying the rapporteurs for each review. Participants were invited to review the objectives listed in the TOR, the Ecologically and Biologically Significant Area products, and not the specific methods for identifying EBSAs (DFO 2004). The Chair then reviewed the ground rules and process for exchange, reminding participants that the meeting was a science review and not a consultation. The room was equipped with microphones to allow remote participation by web-based attendees, and in-person attendees were reminded to address comments and questions so they could be heard by those online.

Members were reminded that everyone at the meeting had equal standing as participants and they were expected to contribute to the review process if they had information or questions relevant to the paper being discussed from various organizations and sectors, including: Fisheries & Oceans Canada, Parks Canada, Environment Canada, the Haida Oceans Technical Team, Cowichan Tribes, Marine Planning Partnership (MaPP), Georgia Strait Alliance, University of British Columbia, British Columbia Marine Conservation Analysis, and the Pacific Salmon Foundation.

Nadine Templeman, Neil Davis, and Rebecca Martone provided detailed written reviews for all working papers to assist the committee and the authors. Similarly, species experts provided reviews on the accuracy of the data and the analyses. Detailed reviews are provided in Appendix E. Participants were provided with copies of the written reviews before the meeting. At the beginning of the meeting an announcement was made of the change in authorship for two of the four documents. Both documents originally cited as 'Levesque and Jamieson' were changed to 'Jamieson and Levesque'.

The conclusions and advice resulting from this review will be provided in the form of a Science Advisory Report for providing advice to DFO to inform Oceans planning in the Pacific region will be made publicly available on the CSAS Science Advisory Schedule at http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm.

PRESENTATION OF WORKING PAPERS

Glen Jamieson presented a summary of his analysis to identify ecologically and biologically significant areas (EBSA's) within Canada's three Pacific continental shelf ecoregions; Strait of Georgia (SoG), West Coast Vancouver Island (WCVI), and Pacific North Coast Integrated Management Area (PNCIMA).

PRESENTATION: PACIFIC CANADA EBSAS (GLEN JAMIESON)

In 2004 the Pacific North Coast Integrated Management Area (PNCIMA) was selected as one of five large ocean management areas to pilot integrated management (IM) planning. To date the achievements of the national focus on IM have included a comprehensive ecosystem overview (Lucas et al. 2007) and a series of national workshops held to determine protocols for the development of conservation objectives (DFO 2004; Powles et al. 2004; DFO 2006, 2007). The overall concept was that ecological/conservation objectives were to be derived from knowledge of ecologically and biologically significant areas (EBSA), ecologically significant species (ESS), depleted species, and degraded areas.

Identifying EBSAs is not a general strategy for protecting all habitats and marine communities that have some ecological significance. Rather, it is a tool for calling attention to a geographical area that has particularly high ecological or biological significance, and to facilitate a greater than usual degree of risk aversion in management of activities. The spatial scale of an EBSA should ideally match the scale of the relevant attribute that makes the EBSA ecologically or biologically significant, including habitat features, life history features, community structure, and connectivity. Although this analysis doesn't take into account the degree of temporal variation, this is an important aspect and should be considered in management action planning.

EBSAs are not identified based on risk. The EBSA criteria were defined at a national DFO workshop (DFO 2004). Criteria for EBSA selection include; uniqueness (rarity), aggregation, and fitness consequences. Areas can be further distinguished by naturalness and resilience. Areas that do not qualify as EBSAs are not considered ecologically unimportant, they simply do not require at this time an enhanced level of protection compared to other areas. With on-going studies the boundaries and numbers of EBSAs may evolve and change. Currently, only scientific data are being considered in EBSA determination. In the final Integrated Management

(IM) assessment stage, other areas may be flagged for enhanced protection based on their social, cultural or economic values. However, the identification of EBSAs is a management planning tool only – it does not imply formal designation or any form of legal protection.

The focus of the four papers is Canada's three Pacific continental shelf ecoregions; Pacific North Coast, West Coast Vancouver Island, Strait of Georgia.

Most of the experts consulted for these analyses represented a government agency; however some environmental non-government organization experts were consulted. For some species or groups of species the Important Areas (IAs) maps may be based solely on one expert, while other species' maps may be based on inputs averaged from a number of experts.

There were several recurring issues when trying to achieve consistency in data gathered from experts. These included questions regarding temporal scale, reduced species abundances and data poor situations. What is the appropriate time series of data that should be considered in habitat usage? Should only existing usage areas that fit into the criteria be identified? How to handle areas that are used at different life stages in this analysis? The more information that was available for a species, the finer and usually smaller the areas are that were identified, regardless of the scale of distribution of the species. In contrast, the less that is known about a species the larger the identified area is because the data may only represent a broad distribution. In addition, expert time constraints in acquiring and interpreting appropriate data were also a concern.

Challenges to the analysis included how to handle large guilds of species (e.g. Seabirds, Flatfish, and Rockfish); collected data had generally not been gathered specifically to answer ecosystem based management questions; new analysis or data collection may be needed.

Experts ranked each IA they identified from 1 – 10 for each of the five EBSA criteria. The occurrence and overlap of identified IAs was compared with major oceanographic features, bottleneck areas and unique physical features. Unique physiographic features may be considered ecologically important because in many cases, they provide the physical basis and serve as relatively easily measurable proxies for biological ecosystem attributes. These physical features can describe the specific physical environmental conditions that rationalize ecologically significant communities.

Some oceanographic features such as thermal stratification in sheltered waters may be too extensive to be useful in defining an EBSA, though this feature has also partially been captured in overlays with other oceanographic features (e.g. bottlenecks). In relatively small inshore areas, smaller scale oceanographic features can be associated with structures such as fjordal sills, etc., to create frontal zones, however these were considered too small to be identified a the scale of EBSA, which are areas identified at the large ocean management area (LOMA) scale.

One of the challenges of the project was that some criteria for some species could not be easily evaluated. An area may have high aggregations of a species, but it is not known why that species congregates there. Fitness consequences also often can't be easily evaluated, as a species presumably uses all its habitats because they are all important. Whether alternate comparable habitats exist is often not known.

Following the presentation, the committees' discussions noted that there are several challenges to this analysis. These included species selection, expert selection and participation as well as the confidence in the Delphic approach. There were concerns related to how gathered data were utilized to identify Important Areas (IAs) and develop EBSAs, how to account for data poor situations and issues associated with small scale, such as nearshore areas. Questions regarding the boundaries of the IAs and EBSAs were also raised.

PRESENTATION AND DISCUSSION OF WRITTEN REVIEWS

The formal reviewers provided some context as to why they were selected to review the four documents. Nadine Templeman had participated in a similar process in Newfoundland, while Neil Davis and Rebecca Martone represented the Oceans program, the clients asking for the advice from this process. Species experts were also asked to provide reviews of the EBSA process, based on their knowledge of particular species or groups of species. Their reviews are summarized below. All detailed reviews are provided in Appendix E.

NADINE TEMPLEMAN (DFO SCIENCE, NL REGION)

Nadine Templeman provided a summary of the process undertaken in Newfoundland to determine EBSAs for Placentia Bay/ Grand Banks (PBGB) large ocean management area (LOMA). The process incorporated the Delphic approach, review of published papers and existing maps, as well as feedback from managers and national guidance. Overlaid areas were used to identify significant areas within PBGB. A working group and steering committee was formed to inform the identification of EBSAs. It is expected that the PBGB EBSA process will be complete by the fall of 2012. This process will take a quantitative approach to start, and will use the Delphic approach to deal with data gaps. As in all regions, data gaps are a big issue, particularly for northern areas. Other important issues that have been encountered include how to scale data up and down, and how to determine what an EBSA will be. All regions are working with the same criteria, but it's necessary to recognize that regions differ with respect to data availability and quality.

In general, the reviewer stated that the purpose of the papers was clear and the authors conveyed caveats, uncertainties, etc. The reviewer advised that the EBSA process should strive to be quantitative where possible, while acknowledging it may not be possible for all cases. Issues around scale and data quality will be regionally specific to resources and data availability. The reviewer also stressed that for management purposes, caveats and uncertainties need to be clearly stated.

The reviewer felt that the Delphic approach was appropriate for this analysis because it is important to work with the information that is available. The methodology for phase 1 (Identify IAs based on EBSA criteria) was clearly defined. However the reviewer felt that the ranking of IAs created confusion and the explanation could be expanded in the text. The reviewer also noted that shortfalls of the Delphic approach should accompany the benefits in the introduction to the methodology.

The reviewer found that there were inconsistencies in the application of the Uniqueness / Aggregation / Fitness Consequences criteria for the identification of IAs. It was felt that the links between 'aggregation' and 'fitness consequences' criteria were not always acknowledged correctly. The criteria rankings also appeared to be largely non-existent in the SoG; rankings should be standardized for all ecoregions.

The reviewer felt that for decision makers to use the advice presented in the four documents, there should be some consistency in format of descriptions. A suggested format for a species would be to describe the status, ecology, concentration of the species, and then outline the IA and criteria. The reviewer felt that the maps provided were an excellent resource for managers however caveats and uncertainties in the data and the analysis should be presented throughout the four documents.

Specific comments for phase 1 (IA identification) were to include a summary table that would provide the reason(s) for the selection of an IA. The reviewer acknowledged that variation in data available in phase 1 has the potential to affect the outcome in phase 2. The criteria for the species and species groups selected were clear, but some background information would be helpful. It was noted that there appears to be a bias towards including commercial species,

potentially due to lack of available data for non-commercial species. It would be helpful to understand what the biological data gaps are for IA identification.

For the phase 2 EBSA methods the reviewer felt that the chosen proxies were valid, but did not understand why this method was chosen. The reviewer remarked that choosing geographic areas could potentially narrow an IA. It was suggested that an explanation is needed as to why this approach was chosen over alternative methodologies, such as the use of heat maps.

The reviewer also questioned why species groups are included in tables where the proportional IAs captured in the EBSA is less than 20%. It was acknowledged that in developing MPAs some species will be protected by accident as a result of geographic association, but the minimum threshold for the inclusion of a species is unclear. The advice provided was to focus on the key players in the IA for management purposes. This will focus the conservation objectives, and the resulting monitoring, on the species or groups of greatest significance for the area.

The reviewer acknowledged that additional research is necessary and that further systematic analysis is needed of existing data holdings. This will allow for the identification of data gaps and the modification of future research survey plans and protocols. In addition the reviewer commented that it would be helpful to provide some advice on how to apply the advice in the four documents to management actions.

Authors Response

The author felt that it was unfortunate that the first two documents (PNCIMA phase 1 & phase 2) could not be reviewed before the second two were written. He also noted that the oceanographic features and geographic bottlenecks were used as opposed to heat maps because if heat maps had been used then the entire shelf break would be considered an EBSA. With regards to the proportion of species and IAs that were captured within an EBSA, it was difficult to determine a threshold for inclusion without knowing how the end product would be used by management. These papers are assumed to be the first in a series of papers to move forward in the EBSA approach and that continuing to move forward may be the best way to address many of the questions and concerns raised in the reviewers' comments. The author acknowledged that the results are biased by the species included (or excluded) as well as input from experts on their area of expertise.

NEIL DAVIS / REBECCA MARTONE (OCEANS PROGRAM, PACIFIC REGION)

The reviewers started by stating that many of their comments are within the context of Oceans management and the PNCIMA LOMA. They suggested that clarification on the appropriate use of EBSAs to inform management would be useful. The documents need to include a broader perspective on the products from these analyses, how they can be applied and next steps.

Although the criteria for identifying an IA are clear, the criteria used for selection of species or species groups were unclear. The reviewers had many questions pertaining to how the list of species groups was determined, and how the decision was made about what to include. There is a clear bias towards commercial or charismatic species. Is this because we have sufficient information about these species? Were species with insufficient data considered, but not included? The reviewers also stated that it would be useful to know the gaps in this list from the perspective of capturing species significant to ecosystem-based management.

The reviewers noted some data gaps in the analysis, including the limited representation of many species that are found in the nearshore. Many of these species are poorly correlated with the EBSAs. Given that oceanographic features were used to determine the EBSAs, it is not surprising that nearshore species are not captured in this analysis. The use of habitat information was raised as a potential method to address this data gap. It was also noted that many data poor species have no IAs, and that it is unclear how managers can make decisions

given these data gaps. The reviewers also inquired as to how to update the PNCIMA EBSA and IA document to the level presented in the SOG and WCVI.

Comments were made on the scale of the information presented. It was noted that most of the work is at the LOMA scale, and the reviewer suggested it would be helpful to expand on the description of how areas relevant at the LOMA scale are defined. This would provide consistency and transparency for collaborative planning processes.

The reviewers also commented on the application of EBSA criteria to finer scale areas, such as nearshore habitats. There seemed to be acceptance of the need to identify EBSAs for finer scale elements as an important next step. Some advice on what would be needed to do this additional work (i.e. classifications, predictive habitat models, Shorezone models) was suggested.

It was also noted that the EBSA boundaries were not solid, and some guidance on how to address this lack of spatial precision in the context of marine planning is needed. For example, PNCIMA planning will be using a risk-based approach, which will overlay activities on these EBSA maps. What is the most appropriate method to deal with this lack of spatial precision? One suggestion brought forward by the reviewers was to use the boundaries of oceanographic features, which would provide justification for how features were defined and mapped.

The reviewers also requested clarification in the text on how oceanographic features were defined and the level of confidence in the boundaries. They also noted that the current list of features may not be sufficient and that additional features may need to be considered, such as nearshore features. Clarification of the differences between the oceanographic application (used here in the EBSA analysis) and other approaches (e.g. BCMCA or CMA) was also suggested. The reviewers commented on the lack of guidance on how to integrate or compare the results with other work. Guidance was also requested on how and when to use IAs versus EBSAs, and if there are any benefits of using the EBSA process over a risk-based approach (which is currently being pursued though the PNCIMA initiative). The reviewers also questioned how to incorporate TEK / LEK information into this process.

Additional suggestions included development of useful reference tools, such as tables documenting how each IA was determined, along with the level of confidence for each IA map. Identifying the species or species groups with strong seasonal patterns of distribution was also recommended by the reviewers.

Author's response

The author felt that all of the reviewer's comments were relevant. The questions and comments noted by the reviewer, point towards the fact that this is the first paper leading towards integrated management (IM). The author noted that all of these points cannot be addressed at this point in time. Further work is needed to tackle all of these comments and questions. Regarding species included in the analysis, the author stated that he tried to include everything he was aware of, but this also depended upon available expertise. For example, there was no expertise available for phytoplankton and zooplankton. In hindsight, the author acknowledged a bias towards macrofauna.

SPECIES SPECIFIC REVIEWS

In addition to the formal reviewers, the four documents were reviewed by nine internal reviewers. Each of these reviewers focused on their area of expertise (Pelagic fish; Corals and Sponges; Invertebrates; Turtles; Marine mammals; Groundfish; Salmon; Tuna; Eulachon and Sturgeon) (Appendix E). It was noted by the committee that reviews of aquatic plants, birds, and oceanographic features were missing. In general the species specific reviews of the four documents were favourable.

Common points found in the reviews included the need to add more citations to the text instead of relying on personal communications, and consistency in the spelling of species names and map colouration. Many of the species specific reviewers felt that the analysis may be biased because it relied on input from a sub-set of experts. This can create a situation of gathering opinions from experts instead of scientific facts from literature. Also the time constraints of the project present a challenge in extracting information from experts.

There were many comments around which species or groups were included, and how this was determined. Another recurring point was the importance of considering uncertainty in the adequacy and accuracy of data. Commercial data used may also bias the analysis and may not represent the actual distribution of the species. Some taxa that may impact the identification of important areas (e.g. transient killer whales, coralline algae) were not included, while other taxa (juvenile and adult salmon) were treated differently between the two reports (PNCIMA versus WCVI and SoG). It was also felt that there are new data on the spatial distribution or COSEWIC status for several species (e.g. Grey whales, Basking shark, some rockfish species) that were not included and may be relevant to EBSA identification in the PNCIMA ecoregion. Furthermore, there was a lost opportunity to include local ecological knowledge (LEK) and traditional ecological knowledge (TEK).

Some reviewers were uncertain about how the IA rankings were determined, the consistency in how the criteria were applied, and how oceanographic features drove the determination of EBSAs. For some species only a general spatial distribution is known, whereas for others, details on spawning/pupping areas and aggregation sites are known. The inconsistency in data quality results in a greater weighting for species which have less specific information compared with those species with more detailed information.

Reviewers also raised the point regarding the scale of the EBSAs and how to manage larger areas. The reviewers were unsure how an EBSA will help managers. It was pointed out that the lack of stakeholder input may result in a lack of support for the analysis.

Some committee members commented that in order to improve the process of identifying EBSAs, Science will need to change the way data are collected in the field. This change should be driven by objectives and it will be important to examine what data are currently collected, what data are needed (to meet needs/objectives), and how these data can be utilized.

Authors Response

The author responded by reminding the reviewers that the species experts provided the data they thought were most relevant for this analysis (i.e. reproductive data vs. total distribution) The author emphasized that the data were not altered, and any bias in the data may represent how it was provided. The author also acknowledged that data gaps will create inconsistencies in how the information can be presented. The species presented in the documents were selected by the experts, based on the available information. One of the assumptions of the Delphic approach is that experts provide information based on their knowledge of the publications and specific research. However, the author acknowledges that future work would need to have a more quantitative approach.

GENERAL DISCUSSION

A general discussion among all committee members took place following the presentations by the reviewers and the response from the author.

DELPHIC APPROACH

Much discussion took place on the Delphic approach and how to improve the quality of data gathered using this method. Without incorporating scientific literature the Delphic approach relies solely on experts integrating information on a particular species. It was acknowledged that timelines interfered with the ability for some experts to provide information to this process, and that multiple experts for a particular species, or species group, did not equate to replicates in data collection. As well, there was some discomfort with the fact that most contributing experts were DFO staff. Future suggestions included using a template in order to standardize the data collection process, creating an iterative process to allow experts to review the data, as well as including LEK / TEK expert knowledge.

The author was questioned as to how confident he is in the results presented, given the challenges with the Delphic approach? If more consultations could have been done, would the results be different, and would this change the level of uncertainty? The author responded by stating there is some uncertainty in the results, but no way to quantify it. Instead, it may be better to determine the best way to update these data in the future. It was suggested that the scientific process for this analysis must strive to move away from the Delphic approach in the future, relying more on scientific literature for the next iteration or step in the process.

SPECIES SELECTED

Further discussion took place on the species and species groups selected. Clarification as to why certain species were or were not selected was requested in revisions to the text. Some committee members noted that the inclusion of migratory species may influence the effectiveness in managing EBSAs if the migratory species are adversely impacted by conditions occurring outside of the EBSA boundaries.

Additional comments were made that the data available for the analysis may be weighted towards commercial species and these data may not represent actual distribution patterns of commercial species. This is a known caveat and not an intentional decision. However, it was also noted that some commercially important species were omitted, and that cross-referencing data gathered with IFMPs (Integrated Fishery Management Plans) would ensure that known distributions and data are not omitted. Some members of the committee observed that some of the missing species are ecologically important prey (e.g. Zooplankton, sandlance) and additional datasets were missing (e.g. Important Bird Areas). Additional information on species abundance and distribution could also be found in DFO's general stock status reports. Committee members noted that enhanced survey methods could help with missing datasets in the future.

Committee members questioned whether the global significance of species had any additional weighting in this analysis. The author clarified that this was only the case with the sponge reefs.

Participants suggested adding language to the text to explain why some species were included and others were not and to explain the role of Ecologically Significant Species (ESS) in developing EBSAs. It was clarified that ESS identification is a separate process from that of identifying EBSAs; the identification of a significant species does not equate to the identification of a significant area.

IMPORTANT AREAS (IAS)

General comments on the Important Areas included a need for clarification on how they were defined, and suggestions on the use of a template to ensure that data were gathered consistently using a standard method. This will help the experts to understand how their data will be used and provide better information. Clarification on the weighting of the five criteria used to identify IAs was also requested. The author clarified that when multiple scores were available for the criteria the highest value was used.

Unintentional weighting for species for which we have less detailed information (e.g. general distribution vs. areas of aggregation, spawning or rearing) was also brought forward as a concern.

ECOLOGICALLY AND BIOLOGICALLY SIGNIFICANT AREAS (EBSAS)

General discussion on the identification of EBSAs and the linkage between physical habitat and species data took place. Members of the committee did not feel that oceanographic features and physical bottlenecks sufficiently captured this linkage. Committee members identified the need for some better metric to determine how suitable the EBSA is for each species. The current analysis assumes some similarity between all IAs. In reality for some species it would be important to protect some proportion, and for other species a different proportion.

Concerns were raised in regards to the process followed to identify EBSAs. The committee felt that the lack of sourced and referenced literature data creates problems understanding why some species have been included within certain EBSAs. In addition there is a need to allow species experts to review EBSAs to see how their species are included in EBSAs. It was agreed that distribution data alone cannot be used to create EBSAs because it does not address how a particular species uses the habitat within an IA, or how to deal with data poor species. The shortcomings of the methodology included the grouping together of species groups, such as salmonids and seabirds. Concern was raised that this process has not been quantitatively rigorous; inputs from experts are not directly comparable from different experts; there is a need to standardize how boundaries are developed. Meeting participants felt the need to develop an approach where all of the steps are standardized to reduce potential inconsistencies in how the methods are applied in future iterations.

Additional discussion included the need to be more restrictive in what is included in an EBSA. For example, should ESBA analysis include migratory species when this may identify an area that will not meet its objectives if there are larger scale changes beyond the bioregion scale? The need to define the threshold of overlap between physiographic features and IA was identified. For example, in the roll-up process from IAs to EBSAs is protecting 20% of the species considered appropriate? What is the threshold?

Discussion took place regarding the physical overlap in some EBSAs. Some EBSAs overlap another EBSA, while others are completely contained within another EBSA (e.g. WCVI ecoregion). Should an area be contained within one or multiple EBSAs? The author stated that these overlaps were due to different oceanographic features. These features may be based on different temporal scales (e.g. eddies). Some members of the committee expressed concern with the overlap and felt it represented an overcounting issue within a region; there is a need for consistency between ecoregions. Elements could be double counted if this analysis is used as a metric for assessing health of the oceans. It was noted that further information is needed to address this issue including understanding how management choices would be different in areas with overlaps.

Most of the discussions around the results of the analysis dealt with the level of confidence associated with individual EBSAs, for which confidence was then ranked high, medium, or low. Some members of the committee were not comfortable with the ranking because of new data

that had become available since the 2005 PNCIMA analysis. There was a general acknowledgment that there are currently more data available for the PNCIMA LOMA than presented in the 2006 papers. This issue needs to be addressed in future updates with some consideration given to how information is presented to managers through both the IA and EBSAs (including maps).

How managers will use this advice should be taken into consideration when determining the level of this assessment. Members of the committee commented on how to improve the presentation of information in the four documents. This included an aggregate table which outlines how much of the IA for an individual species has been accounted for in each EBSA. This would illustrate that a number of EBSAs have been created based on a small percent (<5%) on an individual species IAs which may appear low and/or arbitrary. However others noted that the proportion of IA captured is a meaningless number and care is needed as to how the number will be used in the future. If the proportion of the IA is simply an area calculation it does not take into consideration the utility of the area (e.g. pinniped haulouts can have 100`s of animals at one location).

Contribution of Important Areas to Ecologically and Biologically Significant Areas

Species Group	○ EBSA 1	○ EBSA 2	○ EBSA 3
Marine Birds	% of IA captured	% of IA captured	% of IA captured
Pinnipeds	% of IA captured	% of IA captured	% of IA captured
...	...	...	...

Other members of the committee suggested it would be preferable to have a table that outlines which criteria were captured by each EBSA, as was done in Appendix 5 of the Arctic EBSA advisory process (Paulic et al. 2009). Additional comments were made to include the level of confidence regarding the EBSA within the table.

Members of the committee felt it was important to be consistent in including or excluding a species on distribution data alone. In some cases a species is found within B.C. but not enough is known about its distribution. It is also important to remove species that are not used as justification for the EBSA from this type of table because this information can be misleading. The comment was made that the percentages that are presented in the documents misrepresent the importance of an EBSA to a specific species and it is necessary to consider the use of areas and their importance to species; simple distribution maps cannot be rolled-up to create EBSAs.

Most EBSAs proposed in the research documents were reviewed with high confidence by the Participants; however, four notable changes to the science advice were reached by consensus.

A new EBSA was proposed to encompass the entire Strait of Georgia because the strait as a whole is a migratory bottleneck for juvenile and adult salmonids and other anadromous fishes, and a rearing area for juvenile salmonids. Within the Strait of Georgia, Participants agreed that the EBSA criteria for Sabine Channel were met with low confidence, and this EBSA was removed from the proposed list. The boundary of Baynes Sound EBSA (Strait of Georgia) was expanded to include the entire Important Area for birds. The boundary of the Shelf Break EBSA (PNCIMA) was extended to the shore along Haida Gwaii. Participants recognized that the Brooks Peninsula EBSA identified in the PNCIMA ecoregions extended beyond the boundary of this ecoregion (i.e. southwards), but because the southern portion of the EBSA was also identified as being part of more or more EBSAs identified in the WCVI ecoregion, the boundary was not altered.

DISTINCTION BETWEEN IA AND EBSA

Meeting participants expressed difficulty with the distinction between IA and EBSAs and concern regarding how the information would be used by management. The author responded that an overlap analysis for IAs would result in the entire coast being considered important. In order to identify areas for enhanced management, it was necessary to select distinct areas. In this analysis, oceanographic features were selected to screen/filter the EBSAs.

Some committee members emphasized that a lack of connection between IAs and EBSAs. It was suggested that this could be overcome by developing qualitative criteria to determine how each IA has contributed to a particular EBSA. Spatial overlap is not sufficient criteria to evaluate the EBSAs against IAs; the relationship between an IA and an EBSA is not a linear function. Using IAs alone assumes similarity between all IAs, when in fact IAs are at different scales due to the available data for each species or species group. There is a need for ecological suitability criteria or sufficiency test. An EBSA represents science based advice and therefore the science should be as rigorous as possible.

It was also suggested that experts could complete a post evaluation to see if the EBSAs meet the needs of their species of interest. This would allow experts to measure if the EBSAs capture all the life stages of the species and determine a confidence level. However it is important to note that EBSAs are based on layers at the LOMA or ecoregion scale, whereas IAs are specific to one species.

Some of the experts on the committee that provided data to the authors also commented that they had filtered the IAs for the authors. One expert in particular commented that 80% of areas that he identified are included within the EBSAs, however this does not represent 80% of areas for the particular species within the bioregion, this example highlights some of the problems with the way data can be interpreted and presented in this process.

NEARSHORE

One of the larger data gaps identified by the group was the nearshore habitat, which was defined as the area from ¼ to ½ a kilometre from the shoreline. Committee members commented that they would have expected the nearshore in the WCVI ecoregion to be included in an EBSA. The author acknowledged the nearshore may need to be addressed at a different scale. It was also recognized that there was a lack of data regarding oceanographic features in the nearshore versus offshore areas. Substrate may play a more important role in defining nearshore areas and has been used as a surrogate for species in other spatial analysis (i.e. British Columbia Marine Conservation Analysis). The committee noted that in order to be consistent the same habitat features should be used in the nearshore to identify EBSAs. The incorporation of LEK / TEK may be helpful to address the nearshore data gap. Lack of nearshore is a problem that cannot be dismissed as a scale issue. The nearshore contains important habitat to many species within each ecoregion.

It was stated that ESS (Ecologically Significant Species) have captured more of the nearshore than EBSAs through the identification of structural species. It was also suggested that the nearshore should be classified as a moderate level of confidence because of the limited available information. The committee was in consensus on the need to identify EBSAs for finer scale elements such as nearshore areas as an important next step.

DATA GAPS

Discussions took place on data gaps, predominantly on the new information available since the 2006 documents on PNCIMA were written, including changes to species distribution and migration routes. Comments included incorporation of additional data through better data mining; such as commercial bycatch data. As well as incorporating habitat representation for nearshore and estuarine areas. The committee felt that some of the current data gaps could be addressed through experts outside of DFO, incorporating water circulation data, and by integrating LEK and TEK data. Experts identified the need to better understand the analytical techniques that would be applied to the data in order to provide the best summary of existing information. In addition, the committee acknowledged the need to clarify physical data gaps (including data that exist and were not incorporated into this process) versus knowledge gaps that could be identified as areas for future work or habitat modelling.

SCALE ISSUES

Specific comments were made regarding the EBSAs within the SoG ecoregion and juvenile salmon. Members of the committee felt that conditions within the SoG control the success of juveniles (for all salmonid species) or the brood year strength. Some committee members felt that this entire SoG ecoregion should be considered as an EBSA as opposed to specific locations within this ecoregion.

The committee noted that there was a high level of confidence that river mouths and estuaries would be incorporated into an EBSA because of their importance to salmon and other anadromous species, but only a medium confidence for river mouths and estuaries that do not support anadromous species. The author acknowledged that all estuaries important to salmon were identified as IAs and identified as bottlenecks. However on the scale of the maps produced they are not evident.

BOUNDARIES

Discussion on boundaries also included discussion on the overlap between specific EBSAs within a specific bioregion. There are some examples of EBSAs that are partially or completely contained within another EBSA. The individual EBSAs were based on different oceanographic features (currents vs. geographical features). Discussion took place as to where you draw the boundaries between two overlapping EBSAs. It was acknowledged that this is a caveat of the analysis and has occurred in all ecoregions (PNCIMA / WCVI / SoG). The author pointed out that this is a discussion issue for the SAR, but that the maps within the published PNCIMA report cannot be changed at this point. It was acknowledged by the committee that the overlapping EBSAs would be a location to refine in future work / updates of this analysis.

General debate on boundaries included whether it was appropriate to draw maps with solid lines, or fuzzy lines to represent uncertainty. Other members noted that they would like the boundaries to illustrate the level of confidence in the boundary and represent the fact that boundaries within the marine ecosystem are much more fluid than the solid lines displayed on a map. Others felt that this would add a layer of complexity to the maps. Comments were made that the role of Science is to provide advice not designate areas and this advice may include raw data to allow managers to interpret the information. Members of the committee noted that the lessons learned workshop (DFO 2011) concluded that Science should provide solid lines. However other members of the committee noted that additional background information in the text as to how the boundaries were developed is needed and would be helpful for managers. This is especially important for EBSAs that encompass oceanographic features such as gyres to help managers understand their dynamic nature over time and space.

The author commented that interpreting boundaries and the level of confidence associated with them would require going back to the raw data, which is not feasible at this time.

APPLICATION OF THIS WORK

It was noted that some of the terminology used in the documents was very close to management application and that the text should be edited. Strong language such as the terms "designated" and "proposed" may have implications for managers in the future. EBSAs are not designated and the Oceans Act does not grant the power to designate them. Care needs to be taken to ensure that the EBSAs are presented as scientific advice.

Members of the committee expressed a concern regarding the challenge to maintain living maps that reflect current information. It was confirmed that all data and metadata for the four documents would be archived by the GIS Unit at Regional Headquarters in Vancouver, British Columbia.

Members of the committee commented that more effort is needed to define the application of the IAs versus the EBSAs and how to interpret the two different products. It was recognized that without the IAs being specified, managers are limited by what information they can use to inform decision making. This could result in areas for enhanced management that supersede individual species, which was not the point of this exercise. The EBSAs are not meant to be a stand alone product for integrated management. The IAs are important and not discarded in the process of the rollup into EBSAs. If an area identified as an EBSA becomes an Area of Interest for a Marine Protected Area (MPA), an assessment is still required as part of the designation process.

The committee was unsure how to provide guidance for managers regarding the purpose and potential use of EBSAs. It was decided that these questions would be best answered by the lessons learned national workshop. It was also noted that clear language regarding what can and cannot be accomplished by an EBSA is needed in order to effectively manage areas along the coast, and achieve stakeholder support.

It was suggested that a prioritization of biological and ecological importance of the EBSAs is needed. Others felt that this would add a layer of complexity and that the committee members may not have enough expertise to undertake this prioritization exercise at this time, but could be a next step in this process.

Members of the committee questioned the timeline for future work. At this point a timeline for future work would have to be set by management. It was expressed that national lessons learned workshops (DFO 2011) have provided some guidance on how to improve the process. The committee identified the need to update information in the IA maps. However, as the Delphic approach is not standardized, updating the IAs will not be a straightforward exercise.

In conclusion, the committee agreed that the authors made a commendable effort in synthesizing the information available to complete this analysis. The committee accepted the papers with significant revisions. Due to time constraints, the committee agreed that the co-chairs could write the SAR documents, while the proceedings would be written up by the rapporteurs.

REFERENCES

DFO. 2004. Identification of Ecologically and Biologically Significant Areas. CSAS Ecosystem Status Report. 2004/006. 15p

DFO. 2006. Identification of Ecologically Significant Species and Community Properties. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2006/041.

DFO. 2007. Guidance Document on Identifying Conservation Priorities and Phrasing Conservation Objectives for Large Ocean Managment Areas. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2007/010.

DFO. 2011. Application of Ecologically and Biologically Significant Areas (EBSA) Criteria - Lessons Learned; May 19 - 20, 2011. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2011/046.

Lucas, B.G., S. Verrin and R. Brown (eds.) 2007. Ecosystem overview: Pacific North Coast Integrated Management Area (PNCIMA). Can. Tech. Rep. Fish. Aquat. Sci., xiii + 104p.

Paulic, J.E., M.H. Papst and D.G. Cobb. 2009. Proceedings for the Identification of Ecologically and Biologically Significant Areas in the Beaufort Sea Large Ocean Management Area. Can. Manuscr. Rep. Fish. Aquat. Sci. 2865. ii + 46p.

Powles, H., V. Vendette, R. Siron and B. O'Boyle. 2004. Proceedings of the Canadian Marine Ecosystems Workshop. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2004/016.

APPENDIX A: AGENDA

Regional Peer Review Meeting (RPR)

Centre for Science Advice Pacific

AGENDA
Evaluation of Proposed Ecologically and Biologically Significant Areas in Marine Waters of British Columbia

February 7-8, 2012
Pacific Biological Station
3190 Hammond Bay Road, Nanaimo, BC V9T 6N7
Chairpersons: Janelle Curtis, Ian Perry

Day 1 – Tuesday February 7th

9:00	Welcome & Introductions	Ian Perry, Janelle Curtis
9:10	Housekeeping, Review Terms of Reference, Agenda, CSAS & Meeting Procedures	Ian Perry, Janelle Curtis
9:30	Presentation of Working Papers	Glen Jamieson
10:30	*Break*	
10:45	Reviewer Presentations & Author Response	Nadine Templeman, Neil Davis, et al.
12:00	*Lunch Break*	
1:00	West Coast Vancouver Island EBSAs	RAP Participants
2:30	*Break*	
3:00	Strait of Georgia EBSAs	RAP Participants
4:30	*Adjournment*	

Day 2 – Wednesday February 8th

9:00	Welcome & Introductions	Ian Perry, Janelle Curtis
9:05	Housekeeping, Review Terms of Reference, Agenda, CSAS & Meeting Procedures	Ian Perry, Janelle Curtis
9:15	PNCIMA EBSAs	RAP Participants
10:30	*Break*	
10:45	Best Practices for archiving, maintaining, and updating EBSA databases	RAP Participants
12:00	*Lunch Break*	
12:45	Group discussion: unresolved issues, recap and next steps	RAP Participants
2:15	*Break*	
2:30	Draft key SAR messages	RAP Participants
4:30	*Adjournment*	

APPENDIX B: ATTENDEES

Last Name	First Name	Affiliation	Attend
DFO Participation			
Boldt	Jennifer	Science MEAD	A
Boutillier	Jim	Science MEAD	A
Brown	Laura	Science MEAD	A
Brown	Robin	Science OSD	A
Chamberlain	Jon	Science OSA	A
Curtis	Janelle	Science MEAD	A
Davies	Sarah	Science MEAD	A
Davis	Neil	OHEB Oceans	A
Evanson	Melissa	FAM	A
Finney	Jessica	Science MEAD	A
Gillespie	Graham	Science MEAD	A
Hannah	Lucie	OHEB Oceans	A
Holmes	John	Science	A
Irvine	Jim	Science	A
Joyce	Marilyn	Science CSAP	A
Lougheed	Cecilia	DFO, Ottawa	A
Martone	Rebecca	OHEB Oceans	A
Neville	Chrys	Science	A
Nichol	Linda	Science	A
O	Miriam	Science	A
Olesiuk	Peter	Science	A
O'Neill	Jennifer	Science MEAD/EARS	A
Perry	Ian	Science MEAD	A
Rasmussen	Glen	OHEB Oceans	A
Rogers	Juanita	South Coast RM	A
Schweigert	Jake	Science	A
Templeman	Nadine	Science, NL Region	A
Workman	Greg	Science	A
External Participation			
Ayers	Cheri	Cowichan Tribes	A
Bodtker	Karin	Living Oceans Society	A
Day	Andrew	West Coast Aquatic	A
Gregr	Ed	SciTech Consulting	A
Jamieson	Glen	Scientist Emeritis	A
Jones	Greg	Environment Canada, Vancouver	A
Pearsall	Isobel	Pacific Salmon Foundation	A
Robinson	Cliff	Parks Canada	A
Sloan	Norm	Parks Canada	A
Thompson	Jason	Haida Oceans Technical Team	A
Zinovitch	Bill	Province of BC	A
Smith	Jo	MAPP	A
Wilhelmson	Christanne	Georgia Strait Alliance	A
Wong	Cecelia	Environment Canada, Vancouver	A

APPENDIX C: TERMS OF REFERENCE

TERMS OF REFERENCE

EVALUATION OF PROPOSED ECOLOGICALLY AND BIOLOGICALLY SIGNIFICANT AREAS IN MARINE WATERS OF BRITISH COLUMBIA

Regional Peer Review – Pacific Region

7-8 February 2012
Nanaimo, B.C.

Chairpersons: Janelle Curtis, Ian Perry

Context

Under *Canada's Oceans Act* (1997), "conservation, based on an ecosystem approach", is of fundamental importance to maintaining biological diversity and productivity in the marine environment". This Act provides the legislative framework for an integrated ecosystem approach to management in Canadian oceans, particularly in areas considered ecologically or biologically significant. DFO has developed guidance for the identification of ecologically or biologically significant areas (EBSA) (DFO 2004), and has endorsed the scientific criteria of the Convention on Biological Diversity (CBD) for identifying ecologically or biologically significant marine areas as defined in Annex I of Decision IX/20 of its 9th Conference of Parties (UNEP/CBD, 2008)

The identification of EBSAs in the Canadian Pacific region will serve as a key component of the knowledge base for: i) regional development activities and marine use planning; ii) the development of Canada's network of marine protected areas (MPA) under the *Oceans Act*; and, iii) facilitating the implementation of DFO's Sustainable Fisheries Framework under the *Fisheries Act*. In addition, this information will be of value to other federal Departments and the Province of British Columbia, who are responsible for the management of marine activities in this region (e.g. resource extraction, marine shipping, ocean dumping, spill response, cable laying, land use planning, etc.).

A Canadian Science Advisory Secretariat (CSAS), Regional Advisory Process (RAP) will be held in Nanaimo, British Columbia, to provide peer review of two working papers developed in support of providing science advice on the identification of marine EBSAs in the Strait of Georgia and west coast of Vancouver Island areas, and to update information on the identification of EBSAs in the Pacific North Coast Integrated Management Area (PNCIMA), using the EBSA criteria defined by DFO.

Objectives

The objective of this science advisory process is to identify ecologically and biologically significant areas (EBSAs) in Canadian Pacific marine waters, specifically the Strait of Georgia, west coast of Vancouver Island, and the Pacific North Coast Integrated Management Area (PNCIMA). It is not the objective of this advisory process to review the specific methods for identifying ecologically and biological significant areas; these have been reviewed as part of national DFO advisory processes (DFO, 2004; 2011).

To achieve this objective, meeting participants will address the following:

1. Identify EBSAs in the Strait of Georgia, west coast of Vancouver Island, and Pacific North Coast Integrated Management (PNCIMA) areas, using the best available information and the criteria defined by DFO (DFO, 2004);
2. For the EBSAs identified in each area:
    a. Provide justification outlining why the identified EBSAs are considered ecologically or biologically significant, including their strengths and limitations; and
    b. Indicate the level of confidence in the delineation of the identified EBSAs, and sources of additional data that might be available to incorporate into future databases for these areas, as well as any sources of uncertainty;
3. Provide maps indicating the locations of the identified EBSAs in the Strait of Georgia, west coast of Vancouver Island, and Pacific North Coast Integrated Management (PNCIMA) areas;
4. Identify best practices for archiving, maintaining and updating databases, and potential next steps to improve the identification of EBSAs in these regions.

The following papers provide the basis for discussion and advice on the specific questions outlined above:

- Clarke, C.L., and Jamieson, G.S. 2006a. Identification of ecologically and biologically significant areas in the Pacific North Coast Integrated Management Area: Phase I – Identification of important areas. Can. Tech. Rep. Fish. Aquat. Sci. 2678: 59 p.
- Clarke, C.L., and Jamieson, G.S. 2006b. Identification of ecologically and biologically significant areas in the Pacific North Coast Integrated Management Area: Phase II – Final Report. Can. Tech. Rep. Fish. Aquat. Sci. 2686: v + 25 p.
- Levesque, C. and Jamieson, G. Identification of ecologically and biologically significant areas in the Strait of Georgia and off the west coast of Vancouver Island: Phase I – Identification of Important Areas. CSAP Working Paper 2011/P51.
- Levesque, C. and Jamieson, G. Identification of ecologically and biologically significant areas on the west coast of Vancouver Island and the Strait of Georgia, and in some nearshore areas on the North Coast: Phase II – Designation of EBSAs. CSAP Working Paper 2011/P58

Expected publications

- CSAS Science Advisory Report (1)
- CSAS Research Documents (2)
- CSAS Proceedings (1)

Participation

- DFO Science Branch
- DFO Fisheries Management Branch
- Province of BC
- Commercial and recreational fishing interests
- First Nations
- Non-government organizations
- Academia

References Cited

DFO, 2004. Identification of Ecologically and Biologically Significant Areas. DFO Can. Sci. Advis. Sec. Ecosystem Status Rep. 2004/006.

DFO. 2011. Ecologically and Biologically Significant Areas – Lessons Learned. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2011/049.

UNEP/CBD. 2008. Decision adopted by the Conference of the Parties to the Convention on Biological Diversity at its Ninth Meeting IX/20. Marine and coastal biodiversity COP/DEC/IX/20. 12p. http://www.cbd.int/doc/decisions/cop-09/cop-09-dec-20-en.pdf

APPENDIX D: WRITTEN REVIEWS

Reviewer: **Nadine Templeman, DFO Science, NL Region**

Working Paper: Chantal Levesque and Glen S. Jamieson. *Identification of Ecologically and Biologically Significant Areas in the Strait of Georgia and off the West Coast of Vancouver Island: Phase I - Identification of Important Areas.* CSAP Working Paper 2011/P51

1) Is the purpose of the working paper clearly stated?

The working papers are clear in their goal of ultimately identifying EBSAs, as well as any preliminary (and key) steps to get there – e.g. important areas; mapping, analysis. This includes identifying any background information regarding the origin of the initiative as well as considerations in the application of the results for future ecosystem based management initiatives.

2) Are the data and methods adequate to support the conclusions?
3) Are the data and methods explained in sufficient detail to properly evaluate the conclusions?

It is recognized that methods are largely dependent upon regional conditions, e.g., data and resources. As such, the general methodologies undertaken for the SoG and WVCI, i.e. modified Delphic approach, are applicable to the areas of interest, especially for a first attempt at this type of exercise where available data within these is largely collected for the purposes of fisheries management of commercial species versus integrated management of ocean spaces (single species versus ecosystem approach to management). The chosen methods are clearly described as an approach to overcoming shortfalls that hinder the ability to perform other methods of evaluation, e.g., quantitative GIS analysis. Still, it is recommended that shortfalls of this methodology accompany the benefits as highlights within the introduction.

It should be noted that although the described methodology itself is appropriate for the identification of IAs (and ultimately EBSAs), inconsistencies in the application of methodologies for the identification of IAs is apparent. This is especially true in the application of uniqueness, aggregation and fitness criteria between, and even within, species. At the same time, the described methodology outlines a process for ranking IAs identified by experts, yet it this is largely non-existent in the exercise for SoG and WCVI. Therefore section on Ranking Important Areas is very confusing – too much information is provided for 2011 SoG and WVCI regarding 2006 PNCIMA details on ranking; but ranking was not applicable to 2011 exercise. Details that are not applicable to the SoG and WVCI exercise should be removed from that working paper. Given these inconsistencies it often becomes difficult to properly evaluate the validity of identified IAs (or at least from the text).

Within individual species evaluations most ecological considerations are explained in detail – including the background and available information supporting the group/species specific assessment. Within the SoG and WCVI exercise, however, while concentrations are often highlighted it is not outwardly obvious (or stated) in many instances whether all such areas are "important" or not. As noted above, criteria met should also always accompany identification of IAs. In some cases this may require further reasoning (in non-obvious cases) to this end.

4) If the document presents advice to decision-makers, are the recommendations provided in a useable form, and does the advice reflect the uncertainty in the data, analysis or process?

In addition to the suggestions for evaluations of IAs text noted above, text descriptions could benefit from some consistency in format for use by decision-makers, e.g., status > ecology > concentrations > important areas/criteria. It would also be very beneficial to the document to produce a summary table of the species/layers assessed, including whether or not IAs were identified for each, and the criteria each IA met. This recognizes that information within associated Research Documents is used by managers to gain context to the advice and for communicating potential management measures during consultatations.

5) Can you suggest additional areas of research that are needed to improve our assessment abilities?

Further and systematic analysis of existing data in a manner designed to attempt to address questions such as significant areas in the Pacific should be undertaken as resources permit – or should be incorporated into existing activities as allowed. This will become increasingly important as science advice is requested to support spatial management initiatives related to integrated oceans management and sustainable fisheries considerations. For example, where databases include information that may indicate linkages to activities such as spawning/rearing (e.g., sex, size, weight, length), or habitat preferences (e.g. GIS coordinates), these should be investigated.

It should also be noted that not only stock assessment databases, and the evaluation of them, needs transformation – how research surveys are conducted will also require modification over time to better meet ecosystem-based management requirements. This involves moving away from sampling only commercial spp. to including additional species – as well as enhancing the data collected (e.g. additional measurements) on existing and new species surveyed.

EBSAs for PNCIMA, WCVI, and SoG – Neil Davis and Rebecca Martone Review Comments

Thank you for the opportunity to review these papers. The identification of draft Ecologically and Biologically Significant Areas (EBSAs) represent a substantial effort to generate information that will be relevant to the Department's and others' work towards more ecosystem based approaches to ocean management.

I am approaching this review through the lens of my work as a program manager within the Department's Oceans branch. My primary focus regarding EBSAs is their appropriate use to inform management. I am not a marine biologist or ecologist, nor an expert in the data available for different species. Therefore, my comments here do not consider much about the currency or accuracy of maps for each species or species group, the level of confidence in the maps, or what other data sources might be appropriate to integrate etc. Rather, I have been asked to take a broader perspective, looking at the products as a whole. Many of my comments relate to how EBSAs can be applied in management contexts, what revisions may be helpful to strengthen the products, or what may be valuable next steps to build on these products. Also, thanks to my colleague Rebecca Martone, for her contributions to this list of comments.

Primary comments

1. In the context of collaborative planning processes like the PNCIMA initiative or West Coast Aquatic planning where these products may be used, other participants in the planning process (e.g., First Nations, other government departments, user groups etc) are likely to identify what they feel to be significant areas for ecological or biological reasons. To help in providing consistency and transparency to discussions like these, it would be helpful to expand on the description of how areas relevant at the Large Ocean Management Area scale are defined; examples and/or criteria may help with this. This may also help in explaining what may be, for some, counterintuitive results of this work - e.g., Johnstone Strait as the sole Important Area (IA) for salmon within PNCIMA.

2. While the criteria for identifying IAs for a given species or group are clear, it is less clear how the authors have arrived at the list of species and species groups for which they identify IAs. The authors acknowledge a bias towards commercial and charismatic species, and this is an important starting point of explanation. Further information about how the list was formed would help, e.g.,
    a. is this all things for which we have "sufficient" understanding? How was the determination made about what to include? Are there things with sufficient information that were considered but not included? If so, why weren't they included?
    b. What are the gaps in this list from the perspective of capturing things important to goals for ecosystem management, which past CSAS reports have identified as (in a nutshell) conserving biodiversity, productivity, and marine environmental quality?
        i. One suggestion may be to compare the list of EBSA themes with the draft lists of Ecologically Significant Species (ESSs), where these ESS lists exist, to identify potential gaps.

3. The locations of EBSAs in phase II is driven largely by the identification of oceanographic features, bottlenecks, and coral and sponge communities. Thus, it seems of particular importance to strengthen the explanation of how these features are defined and mapped, and to verify the level of confidence in their spatial representation.

4. Guidance on how to integrate the results of the EBSA process with the results of similar work would be helpful. For example, the data-driven work of the BC Marine Conservation Analysis used Marxan to identify areas of high conservation value. The authors also identify the inclusion of traditional and local ecological knowledge as a gap – how could such knowledge be integrated with outputs from the EBSA process?

5. Though this topic would likely require more than only Science input, some discussion and guidance on the appropriate instances in which to use IAs vs. EBSAs to inform different management decisions will be useful for managers. For example, the PNCIMA initiative is taking a risk-based approach to identifying management priorities within the area, wherein activity based pathways of effects models will be applied to identify the effects of activities on specific things (e.g., species) that have been identified as important within PNCIMA, and any significant risks posed by those effects – what considerations should guide the determination of whether IAs or EBSAs are more appropriate as inputs to this risk-based approach?

6. Some guidance is required for what we do with things that are key ecosystem components that don't have IAs. While the oceanographic features may capture these species to some degree, this approach isn't necessarily sufficient. Perhaps a habitat-based approach would be a better one? Or at least, this should be addressed in this review process to specifically discuss how the oceanographic features capture those species.
    a. Clarifying the differences, benefits, and drawbacks of the EBSA approach compared to other approaches, like a habitat-based approach, would also be useful (see also comment 3 in "secondary comments").

7. Related to comment 6 above, a challenge of the IA and EBSA approach is that it does not identify areas lacking information. In future stages, data-deficient areas could be identified as IAs. Advice for how to deal with species or areas that are data deficient would be helpful, as well as advice on how EBSA gaps can be highlighted in a clear and consistent manner to facilitate research priorities for management.

8. "When broad groupings of IAs were compared, plankton-based IAs had the best coverage with oceanographic IAs (86.67%). Not surprisingly, freshwater-associated species had the worst coverage (21.43%); while macroinvertebrates (41.18%), structural species (42.86%) and benthic species (53.57%) all showed relatively poor correlation." (PNCIMA EBSA Phase II, p. 3,4)
    a. These are not great correlations given the importance of some of these species, so how do we deal with these species?
    b. Could we use a habitat or representativeness approach for these nearshore species/habitats and for species for which we don't know IAs but know general life history and habitat information?

9. The approaches used to identify IAs (i.e., to interpret and apply the EBSA criteria) for certain species – e.g., salmon - in the later work for WCVI and SoG appear more advanced that they were for the earlier work in PNCIMA. Updating the PNCIMA work to reflect these more advanced methods would be helpful if it were possible.

10. The WCVI and SoG papers identify some good work on birds done through another project, but it was not incorporated into the identification of IAs for birds, and it is not clear why. This is also another example of a related project for which guidance on integration is needed (see comment 4).

11. The authors point out that the map boundaries should not be interpreted as precise or black and white. Guidance on how to practically address this lack of spatial precision in the context of potential analyses (e.g., map overlays of IAs and various marine activities) or decision making processes would be helpful.

12. "There are many estuarine bottlenecks in PNCIMA and all of these areas should be treated as EBSAs, though no attempt has been made to define them spatially here because of their relatively small sizes at a LOMA-scale. Anadromous species typically have large geographic ranges and therefore they need to be managed at a LOMA rather than at the smaller Coastal Management Area (CMA) scale, and so bottlenecks that influence them, even if relatively small, are flagged here." (EBSA Phase II p.2)
    a. If they are relevant at the LOMA scale, then they should be defined spatially.

13. Tables for all IAs summarising the level of confidence in each map would be a helpful reference tool.

14. Identification of EBSAs for finer scale and nearshore elements is an important next step.

Secondary / "when and if we could" comments

1. For species or groups with strong seasonal patterns in their distribution, spatial representation of this would be a helpful next step.

2. There are several places in the EBSA papers that refer to questions related to finer scale management, e.g.,

    a. "IA identification at the CMA scale would be a logical next step in the identification of locally significant areas. Scale is particularly relevant when considering shallow-water, near shore species, on a PNCIMA scale map. At the LOMA scale, such areas are typically just a thin line. Also, for wide ranging, low mobility or sessile species in this habitat, it is not clear whether they are adequately captured in IA-identification process. All estuaries are significant, as are eel grass and kelp beds, yet such features are seldom grouped enough at a LOMA-scale to allow their inclusion in mapping. It is presumed here that such features will later be captured at the CMA scale. Regardless, the ecological significance of such features is recognised, and to a large extent whether IAs or not, management already treats these as special features worthy of an enhanced level of management consideration." (PNCIMA EBSA Phase I, p.30)
        i. How to apply the EBSA criteria for things like kelp/seagrass/intertidal invertebrates/marine algal biodiversity/other habitat features/water quality, which are likely to be the VECs for the nearshore?

3. "Determination of significant habitats might be partially achieved through a benthic habitat classification process based on existing physical oceanographic data, as proposed by Vlad Kostylev (Arbour and Kostylev 2002). This approach should identify habitats with unique geoclimatic characteristics, which in turn might be assumed to support unique biological communities. Biological data would be incorporated, permitting this approach to identify areas not presently surveyed that might contain features of interest, such as deep-water corals, that with field verification, could later justify them as being IAs. (PNCIMA EBSA Phase I p. 31, 32)
    a. Would this be an approach that could be taken to address nearshore IA or EBSA identification or to address species for which IAs are not currently known?
    b. What would be needed to do this? Shorezone? BCMCA? Other mapping data?

Review of pelagic fish species in:
Evaluation of Proposed Ecologically and Biologically Significant Areas in Marine Waters of British Columbia
Pacific Regional Science Advisory Process, 7-8 February 2012, Nanaimo, B.C.

Papers:
Clarke, C.L., and Jamieson, G.S. 2006a. Identification of ecologically and biologically significant areas in the Pacific North Coast Integrated Management Area: Phase I – Identification of important areas. Can. Tech. Rep. Fish. Aquat. Sci. 2678: 59 p.
Clarke, C.L., and Jamieson, G.S. 2006b. Identification of ecologically and biologically significant areas in the Pacific North Coast Integrated Management Area: Phase II – Final Report. Can. Tech. Rep. Fish. Aquat. Sci. 2686: v + 25 p.
Levesque, C. and Jamieson, G. Identification of ecologically and biologically significant areas in the Strait of Georgia and off the west coast of Vancouver Island: Phase I – Identification of Important Areas. CSAP Working Paper 2011/P51.
Levesque, C. and Jamieson, G. Identification of ecologically and biologically significant areas on the west coast of Vancouver Island and the Strait of Georgia, and in some nearshore areas on the North Coast: Phase II – Designation of EBSAs. CSAP Working Paper 2011/P58

Reviewer: Jennifer Boldt

Species reviewed: Pacific herring, Pacific sardine, sand lance, and anchovy

Reviewer comments:
Thank-you for the opportunity to review the two reports and two working papers regarding the evaluation of proposed ecologically and biologically significant areas (EBSAs) in marine waters of British Columbia (BC). The authors have compiled a great deal of information for these reports and working papers. The two reports published in 2006 were directed towards identifying EBSAs in the Pacific north coast integrated management area (PNCIMA) and the two current working papers identify EBSAs in southern BC: off the west coast of Vancouver Island (WCVI) and in the Strait of Georgia (SoG). For each of the north and south BC areas, one paper outlines Phase I (identification of EBSAs by experts) and another paper outlines Phase II (use of physical features as a basis for defining EBSAs). This particular review covers only four species that were described in the reports: Pacific herring, Pacific sardine, Pacific sand lance, and northern anchovy, although some comments are applicable across multiple species.

Overall, the information presented on herring, sardine, sand lance, and anchovy is accurate and the comments here will likely not affect the overall outcome of the reports. Improvement to the pelagic species sections include: more references could have been included, and it would have been helpful to have consistency in the definition of "pelagic species" between reports, and consistency in the level of information provided for each species in the reports.

When initially asked to review the pelagic fish species sections, I had difficulty identifying which species were considered pelagic. There are inconsistencies between reports that are not strictly due to differences in species compositions between areas. These issues do not necessarily change the results of the papers, but do make the papers more confusing. A couple examples include:

a.) Sand lance and eulachon are listed separately from pelagic fish in the text of 2011/P51, but listed with pelagic fish in 2011/P58 (Tables 2 and 3).
b.) Pelagic species identified in the text of 2011/P51 are hake, pollock, herring, anchovy, sardine, and tuna; in Table 14 of 2011/P58 pelagic species identified are herring, hake, sardine, and sand lance; in the 2006 Report 2678, pelagic species are hake, herring, and

sardine. Part of the difference between the 2006 and 2011 reports is that sardine are not likely important in north BC. Pollock, however, are identified as a "groundfish" in the 2006 report and as a "pelagic species" in the 2011 report. A definition of "pelagic" (i.e., based on feeding habitat, or predator-avoidance habitat, or spawning habitat, etc), would help, since sand lance, for example, are not really fully pelagic species, as they require certain types of habitat for burying.

c.) Also, past studies indicate that sand lance comprise an important component of groundfish diets in Hecate Strait (Pearsall and Fargo 2007), but sand lance are not included in the 2006 papers for PNCIMA. Why aren't they included?

There was a lack of references to published literature. Perhaps the authors' intention was to maintain the concept that the information was gained through interviews of experts. There are, however, many statements in the reports that do not cite "pers. comm." or the appropriate literature and there are some statements cited as "pers. comm." that could be supported with publications. For example, 1.) 2006 report 2678, page 21: "Herring are concentrate in certain areas of the coast during spawning"; 2.) working paper 2011/P51, page 37: "Juvenile herring migrate from nearshore rearing grounds on the WCVI to offshore feeding areas during the fall from August to October (J. Schweigert, pers. comm.)." There is a significant amount of published literature on herring (as one example), yet almost none are cited. The same comment applies to other species.

The authors have done a commendable job in attempting to summarize habitat use by important species in each region. There are, however, some inconsistencies in the level of information provided for each species of fish. Different life history stages of fish may require different habitats. The authors address these considerations for most species, but not all. For example (referring to 2011/P51, as an example), is it important to note that herring eggs are deposited on kelp and other substrates on the seafloor in nearshore areas or is it sufficient to identify the nearshore spawning areas? There is little information presented on seasonal, feeding, or ontogenetic habitat use by sand lance. Would this information be valuable when identifying areas of risk aversion? Perhaps, the information highlighted here is incorporated into the expert's opinion and is not an issue for the papers, but it would have been helpful to see consistent levels of information for each species and rationale for inclusion or exclusion of different habitats.

Literature Cited:

Pearsall, I.A., and Fargo, J.J. 2007. Diet composition and habitat fidelity for groundfish assemblages in Hecate Strait, British Columbia. Can. Tech. Rep. Fish. Aquat. Sci. 2692: vi + 141 p.

SPECIES SPECIFIC REVIEWS:

Sponge and Coral Review of the EBSA papers
Jim Boutillier

The authors have taken on a very big task and started a very important first step in moving forward on Ecosystem Approaches to Management. What the authors have said about sponges and corals is fairly accurate picture of the very limited information that is available for these taxa, albeit the most recent reports do a much better job explaining aspects such as the difference between sponge reefs and sponge dominated communities. The one area of concern that I have is that they have failed to discuss the implications of the uncertainty of their analysis in light of the adequacy and accuracy of the information presented. For example there are >250 species of sponges on the Pacific coast of Canada (>250) beside the 3-6 species that they identified as forming the sponge reefs and sponge dominated communities in these reports. There is no recognition in the report that there are many other species of sponges that could and do provide important components of the ecosystem in their roles in the food web and as ecosystem engineers in providing structural habitat e.g. *Hyalonema populiferum* is a very large deep water species that lives on abyssal silt and clay and provides some of the only habitat structure in this environment. The coral material doesn't even mention anything about the 80+ species of corals that exist from the shallow sub-tidal out to the abyssal plain. They rated importance of coral areas by the size of the total bycatch without understanding that some species form high concentrations well others, such as the deep water Antipatharia, are uniformly distributed at low densities but are critical in providing habitat in these deeper environs.

I am not concerned that the authors don't have the all the information available on every species. What I am concerned about is that these papers don't recognize the limitations of the data and are suggesting that the prioritization exercise that they outlined should be adopted to distinguish between "important areas" and "EBSAs" which are areas that require enhanced special management protection in the form of MPA designation. This may be true for some unique areas like the sponge reefs but even this is suffering from lack of data in that not all the areas that have been identified by backscatter data as sponge reefs are in fact living sponge communities.

I would argue that the prioritization exercise has a greater potential for harm in that managers may focus their attention solely on priority areas identified and ignore areas meet EBSA criteria but fail to fall into the prioritization scheme. This would apply to areas containing:

1. areas meeting EBSA criteria for biodiversity identified in this exercise "Important Areas" but not "EBSAs "
2. areas that would meet EBSA criteria for biodiversity not considered in the exercise e.g. encrusting coralline algae (over 30 species on the coast, colonies live between 20 and 700 years, and they are known to be critical fitness consequences in the settlement of larvae of certain species of echinoderms, molluscs and coral).

I think the exercise of identification of the ecological and biological significance of the areas is an important piece of information in the delivery of an ecosystem approach to management. I would argue that what we have before us is a snap shot of our knowledge and we need a system that allows us to continually update our understanding of the application of EBSA criteria to areas as we get new information on a much broader range of biodiversity. The information system would be spatially available to managers to assess the risks of all anthropogenic activities.

CSAP RAP for Proposed EBSAs in BC
Review of Invertebrate Information
Graham Gillespie
Head, Shellfish Section

Review of:

Clarke, C.L., and Jamieson, G.S. 2006a. Identification of ecologically and biologically significant areas in the Pacific North Coast Integrated Management Area: Phase I – Identification of important areas. Can. Tech. Rep. Fish. Aquat. Sci. 2678: 59 p.

Clarke, C.L., and Jamieson, G.S. 2006b. Identification of ecologically and biologically significant areas in the Pacific North Coast Integrated Management Area: Phase II – Final Report. Can. Tech. Rep. Fish. Aquat. Sci. 2686: v + 25 p.

Levesque, C. and Jamieson, G. Identification of ecologically and biologically significant areas in the Strait of Georgia and off the west coast of Vancouver Island: Phase I – Identification of Important Areas. CSAP Working Paper 2011/P51.

Levesque, C. and Jamieson, G. Identification of ecologically and biologically significant areas on the west coast of Vancouver Island and the Strait of Georgia, and in some nearshore areas on the North Coast: Phase II – Designation of EBSAs. CSAP Working Paper 2011/P58.

These documents do a commendable job of attempting to define and rank important habitat for commercially and socially important species, not an easy task. I was asked to review four documents; two previously published as Technical Reports, two working papers. I question the necessity of reviewing documents that were published over six years ago, other than to note that such a review would have improved these documents. Several errors in the 2006 document have been corrected in the recent documents. That said, some shortcomings of the 2006 documents have been carried forward to the recent documents.

The terms of reference for the meeting explicitly state that the methodology for determining Ecologically and Biologically Significant Areas (EBSAs) is not under review. Thus, my comments focus on the underlying information (distinct from data) that was used to determine Important Areas (IAs).

Scientific names are provided inconsistently throughout the document; if provided they should be the currently accepted name (*Ostrea conchaphila* is now *O. lurida*; *Panopea abrupta* is now *P. generosa*; *Cancer magister* is now *Metacarcinus magister*) or spelled correctly (*Venerupis phillipinarum* is *V. philippinarum*; *Saxidomus giganteas* and *S. gigantean* is *S. gigantea*). Case issues with common names (Pacific Oyster v. Pacific oyster) need to be consistent. The large bank in Dixon Entrance is Learmonth Bank, not Learmouth Bank. These may be considered inconsequential to the conclusions and recommendations of the reports, but they do reflect on the level of scientific rigor applied to the analyses and conclusions.

These documents purport to update information in the 2006 documents. However, the current documents do not consult recent literature for the species they focus on. There is misplaced reliance on DFO websites and summary corporate documents (Jamieson and Francis 1986; Stocker *et al.* 2001; Underwater World brochures; various management plans; Stock Status Reports that are more than a decade old; unpublished documents cited in other corporate documents); there has been considerable work done and published through CSAS, DFO report series and the primary literature in the intervening six years that should be included in the analyses (and analyses for the areas not included in the 2006 reports should include recent literature as well).

Northern abalone were re-assessed by COSEWIC and their status changed to Endangered in 2009. This is not reflected in the working papers.

The report refers to McIntyre Bay as being in Gwaii Haanas in the crab and scallop sections. This should be Haida Gwaii rather than Gwai Haanas.

The references need considerable work. Several references to documents "submitted to CSAP" need to be updated, removed or shifted to personal communications – reviewers and the target audience cannot access documents that are not published yet. Some references are inaccurate – DFO (2009b) purports to provide information on Manila clams and Pacific oysters as "naturalized" species though neither species is present on the website, nor is the term "naturalized" defined. Harbo *et al.* (1997a,b) are cited documenting distribution of clam species; these reports document distribution of clam beaches without specific information of which species are present. Some citations are not readily available (*e.g.*, Jamieson *et al.* 1990 as cited in DFO 2007b) and some citations are not included in the reference list (*e.g.*, DFO 2005).

Information regarding Tanner crabs is confused. Neither offshore (*Chinoecetes tanneri* and *C. angulatus*) or inshore species (*C. bairdi*) are targets of developing fisheries currently, despite personal communications prior to 2006 and publications from 2001 or 2004. That said, the Important Areas (IAs) for these species are accurately captured.

The 2006 documents identified Pacific Fisheries Management Area (PFMA) 12 (incorrectly identified as Drury Inlet) as an IA for spot prawn. That information is not carried forward in the recent documents. PFMA 12 is consistently one of the highest producing areas for spot prawns, and given the characteristics of the fishery (mature fishery managed to an escapement target, thus landings are likely a good representation of relative abundance both temporally and spatially), this is likely an IA for the species.

The weathervane scallop population off North Beach in Haida Gwaii should be identified as an IA, based on seasonal wash up of large numbers of scallops rather than Science information.

Information for purple urchins is available in Workman (1999), which summarized available information in preparation for fishery development.

The recent phase I document states that it is the Pacific Region's first attempt at the identification of EBSAs, yet cites two 2006 reports that are titled "Identification of Ecologically and Biologically Significant Areas..." Further qualification of this statement is required.

I agree with the caveats and considerations presented in the recent phase I document. The Delphic approach collects information and knowledge from experts, not data. This particular process collected information from a subset of the experts available – inclusion of TEK and LEK would increase the credibility of the process for certain stakeholder groups, but may suffer from issues of scale described in the document. There are data available to determine IAs and EBSAs; the appropriate analyses have yet to be conducted. These data were collected for other purposes (*e.g.*, assessment of status of commercially or socially important species, thus are not inclusive of all species and/or communities that should be considered in EBSA development. While the recommendation to collect more inclusive data that would have utility beyond standard assessments is a good one, considerable work needs to be done to define which types of data are required and what volumes of data would be informative. I believe that the shift from standard assessments to ecosystem approaches will be iterative – initial analyses are required to identify data utility and appropriate collection protocols.

References

Workman, G. 1999. A Review of the biology and fisheries for purple sea urchin (*Strongylocentrotus purpuratus* Stimpson, 1857) and discussion of the assessment needs for a proposed fishery. DFO Can. Sci. Advice Sec. Res. Doc. 1999/163.

Levesque, C. and Jamieson, G. Identification of ecologically and biologically significant areas in the Strait of Georgia and off the west coast of Vancouver Island: Phase I – Identification of Important Areas. CSAP Working Paper 2011/P51.

Levesque, C. and Jamieson, G. Identification of ecologically and biologically significant areas on the west coast of Vancouver Island and the Strait of Georgia, and in some nearshore areas on the North Coast: Phase II – Designation of EBSAs. CSAP Working Paper 2011/P58.

Comments from John Holmes

The focus of these comments is on albacore tuna, *Thunnus alalunga* and the provision of information in support of the EBSA process and Working Papers 2011/P51 and 2011/P58. All of the information on albacore in Canadian waters is fishery dependent and so it may not be a random sampling of spatial or temporal patterns of distribution or abundance.

Albacore tuna is a highly migratory species that breeds in sub-tropical waters in the central and western Pacific Ocean. Juvenile albacore ranging from 2 to 4 years of age migrate annually into the coastal waters of Canada and the United States for feeding, as noted by Levesque and Jamieson (CSAP WP 2011/P51); adults (age 5 and older) are found in sub-tropical waters in the western and central Pacific Ocean. Juvenile albacore inhabit the surface mixed layer off of Oregon, Washington and BC during the summer months. Fishery data show that immature albacore aggregate on the seaward side of the shelf-break (200m isobath) and are observed in most years since 1995 along the WCVI as far north as Brooks Peninsula. Albacore catch and effort records are available for the PNCIMA (but not mentioned by Clarke and Jamieson 2006a), mostly along the shelf-break and offshore, but these occurrences are not consistent annually and may have more to do with the distribution of fishery effort. Albacore are not commonly observed on the continental shelf shoreward of the shelf-break and have not been reported in the Strait of Georgia. The highest concentrations of albacore in BC waters appear to be associated with submarine canyons along the WCVI and trough mouths along the shelf-break in Queen Charlotte Basin, particularly the Goose Island trough. However, the distribution and abundance of juvenile albacore is more strongly influenced by oceanographic features, particularly frontal structures and the increased productivity at their boundaries, than with specific geomorphologic or physiographic features.

The proportion of the juvenile albacore "population" in the eastern Pacific Ocean that migrates into BC waters is usually small, but highly variable. This migration pattern is reflected by the fact that on average more than 75% of the annual catch and effort made in the Canadian fishery since 2000 occurs in the US EEZ, particularly waters off of Oregon, compared to 16-20% in BC waters during the same period.

Juvenile albacore are biological tourists in BC coastal waters between July and October. I am not aware of any areas within the albacore summer distribution in Canadian waters that I would rank highly on the EBSA dimensions largely because these juveniles are only a small component of a single north Pacific wide stock. Therefore no important areas can be identified for albacore and I note that the authors did not attempt to do so.

One general comment applicable to all documents: I understand that the standard format used for the maps in the Working Papers is consistent with the earlier documents (Clarke and Jamieson 2006a,b), but I found it difficult see certain features/areas due to the dark blue colour used to show bathymetry. Can this be changed?

Lastly, I found that cutting off the maps at the Can/US border was a little odd. I understand the reason (no authority), but it seems strange to simply show US waters as a light featureless blue. It might as well be labelled "Here be Dragons".

Jim Irvine - General Comments

I was asked to review four reports, two that had been published in 2006 by Clarke and Jamieson and two completed in 2011 by Levesque and Jamieson.

My review focused on salmon, but because of a recent State of Ocean publication by Bill Crawford and I on PNCIMA, I make some more general comments with respect to PNCIMA literature.

My main concern with the reports pertains to their limited use of the scientific literature. The 2006 reports of course rely on information available to the authors at that time, but a huge amount of work has been undertaken since 2006. It is difficult to assess the validity of the findings of the 2006 reports, although Levesque and Jamieson (2011b) update some of the results from the earlier reports with respect to PNCIMA.

The 2011 reports, at least with respect to salmon, rely largely on the personal communication of two knowledgeable scientists. I agree with most of the information provided, however, much of it (and more) is available in the published literature and I was surprised not to see reference to much of this literature.

Review of 2006 Reports

Clarke, C.L., and Jamieson, G.S. 2006a. Identification of ecologically and biologically significant areas in the Pacific North Coast Integrated Management Area: Phase I – Identification of important areas. Can. Tech. Rep. Fish. Aquat. Sci. 2678: 59 p.

Clarke, C.L., and Jamieson, G.S. 2006b. Identification of ecologically and biologically significant areas in the Pacific North Coast Integrated Management Area: Phase II – Final Report. Can. Tech. Rep. Fish. Aquat. Sci. 2686: v + 25 p.

I question the appropriateness of reviewing reports that were published 5 years ago. The information in Clarke and Jamieson is out-of-date.

Levesque and Jamieson (2011b) update some information of relevance to PNCIMA, but again, place little emphasis on the literature. At the end of this review, I identify some of the literature I would have expected these authors to have cited.

With respect to the salmon information in the 2006 reports:

- In Clarke and Jamieson (2006a), the section on anadromous fish, and Appendix III, map 2 indicates that the marine migration corridor from Campbell River north to the tip of Vancouver Island as of moderate importance, but no where else. Based on early work of the POST programme, the Broughton Archipelago-Johnstone Strait area is identified as an IA for Keogh and Nimpkish coho stocks. Much has been learned since then.
    - Map 2 misses areas vitally important areas to salmon (e.g. Rivers Inlet, Skeena and Nass estuaries).
    - Other research suggests that conditions in Queen Charlotte Sound have a major impact on salmon survival

- Clarke and Jamieson (2006b, pg 2) acknowledge the importance of estuaries for salmon and indicate that all estuaries should be treated as EBSAs, though no attempt has been made to define them spatially because of their relatively small sizes at a LOMA-scale.
- It appears that while rivers and estuaries are recognised as important EBSAs, they are not mapped. Is there a danger that these important areas will be lost in the "roll up" of EBSAs because they are not mapped?
- How would the proposed IS's and EBSA's have differed if more up-to-date information had been included in the analyses.

Review of 2011 Reports

Levesque, C. and Jamieson, G. 2011a. Identification of ecologically and biologically significant areas in the Strait of Georgia and off the west coast of Vancouver Island: Phase I – Identification of Important Areas. CSAP Working Paper 2011/P51.

Levesque, C. and Jamieson, G. 2011b. Identification of ecologically and biologically significant areas on the west coast of Vancouver Island and the Strait of Georgia, and in some nearshore areas on the North Coast: Phase II – Designation of EBSAs. CSAP Working Paper 2011/P58

Information on salmon is more current in these two draft reports than the two 2006 reports. The approach seems to have been one of approaching two scientists and having them identify areas of importance.

- How confident are the authors that the views of the two salmon scientists are comprehensive?
- Fig. 7 (PNCIMA Nearshore EBSAs) in Leveque and Jamieson 2001b is confusing because the colour of the nearshore EBSAs (red) is the same as the highest areas of overlap. Is it possible to adjust the colour scheme to fix?
- 2006 reports mapped important areas as high, moderate and low. 2011 report does not differentiate. Why?
- Map 11 in Folio III shows Juvenile Salmon Important Areas. 2006 report mapped important areas for salmon (adult and juvenile). Why the change?
- Map 11 shows inlets (both mainland and Van Ile) as important for juvenile salmon.
    - This is inconsistent with the approach for PNCIMA, where inlets were not regarded as being important for salmon. Why?
    - Most of the Strait of Georgia is NOT mapped as important for juvenile salmon. Yet the evidence is that the Strait was important to young coho until the early 1990's, and continues to be important seasonally for all salmon species. It seems to me that the Strait should be categorised as important for juvenile salmon, but perhaps not as important as the area off the WCVI.
    - Fig. 2 in Levesque and Jamieson 2011a shows the mainland inlets as having overlapping polygons but not the Vancouver Island inlets although both were identified as important for salmon. Is this correct?

Examples of Literature on PNCIMA Not Cited

Irvine, J.R., and Crawford, W.R. 2011. State of the Ocean Report for the Pacific North Coast Integrated Management Area (PNCIMA). Can. Manuscr. Rep. Fish. Aquat. Sci. 2971: xii + 51 p.

Various appendices to the Lucas et document including:

Crawford, W., Johannessen, D., Birch, R., Borg, K., and Fissel, D. 2007a. Appendix B: Meteorology and climate. *In* Ecosystem overview: Pacific North Coast Integrated Management Area (PNCIMA), edited by B.G. Lucas, S. Verrin and R. Brown. *Canadian Technical Report of Fisheries and Aquatic Sciences* 2667.

Crawford, W., Johannessen, D., Whitney, F., Birch, R., Borg, K., Fissel, D., and Vagle, S. 200b. Appendix C: Physical and chemical oceanography. *In* Ecosystem overview: Pacific North Coast Integrated Management Area (PNCIMA), edited by B.G. Lucas, S. Verrin and R. Brown. *Canadian Technical Report of Fisheries and Aquatic Sciences* 2667.

Mackas, D., Peña, A., Johannessen, D., Birch, R., Borg, K., and Fissel, D. 2007. Appendix D: Plankton. *In* Ecosystem overview: Pacific North Coast Integrated Management Area (PNCIMA), edited by B.G. Lucas, S. Verrin and R. Brown. *Canadian Technical Report of Fisheries and Aquatic Sciences* 2667.

Lucas, B.G., Johannessen, D. and Lindstrom, S. 2007. Appendix E: Marine plants. *In* Ecosystem overview: Pacific North Coast Integrated Management Area (PNCIMA), edited by B.G. Lucas, S. Verrin and R. Brown. *Canadian Technical Report of Fisheries and Aquatic Sciences* 2667.

Pellegrin, N., Boutillier, J., Lauzier, R., Verrin, S., and Johannessen, D. 2007. Appendix F: Invertebrates. *In* Ecosystem overview: Pacific North Coast Integrated Management Area (PNCIMA), edited by B.G. Lucas, S. Verrin and R. Brown. *Canadian Technical Report of Fisheries and Aquatic Sciences* 2667.

Hyatt, K., Johannes, M.S., and Stockwell, M. 2007. Appendix I: Pacific Salmon. *In* Ecosystem overview: Pacific North Coast Integrated Management Area (PNCIMA), edited by B.G. Lucas, S. Verrin and R. Brown. *Canadian Technical Report of Fisheries and Aquatic Sciences* 2667.

Heise, K., Ford, J., and Olesiuk, P. 2007. Appendix J: Marine mammals and turtles. *In* Ecosystem overview: Pacific North Coast Integrated Management Area (PNCIMA), edited by B.G. Lucas, S. Verrin and R. Brown. *Canadian Technical Report of Fisheries and Aquatic Sciences* 2667.

Other Relevant Reports Not Cited

Cummins, P., and Haigh, R. 2010. Ecosystem status and trends report for North Coast and Hecate Strait ecozone. *DFO Canadian Science Advisory Secretariat Research Document* 2010/045. http://publications.gc.ca/collections/collection_2011/mpo-dfo/Fs70-5-2010-045.pdf

Ianson, D., and Flostrand, L. 2010. Ecosystem status and trends report: Coastal waters off the west coast of Vancouver Island. *DFO Canadian Science Advisory Secretariat Research Document*. 2010/046. http://publications.gc.ca/collections/collection_2011/mpo-dfo/Fs70-5-2010-046.pdf

The most comprehensive on-line source of information is the Internet site of the *PNCIMA Initiative*, (http://pncima.org/), which maintains a comprehensive list with direct access to many valuable reports and peer-reviewed publications dealing with governance, science, ecology, management, industry and First Nations issues: http://www.pncima.org/site/document-library.html.

The next two reports present information on status and trends of marine species, and on how the PNCIMA ecosystem functions:

Hall, A. 2008. *State of the Ocean in the Pacific North Coast Integrated Management Area (PNCIMA)*. David Suzuki Foundation. http://www.davidsuzuki.org/publications/downloads/2008/State_PNCIMA_FINAL_COPY.pdf

Molnar, M., Clarke-Murray, C., Whitworth, J., and Tam, J. 2009. *Marine and coastal ecosystem services: A report on ecosystems services in the Pacific North Coast Integrated Management Area (PNCIMA) on the British Columbia coast,* David Suzuki Foundation http://www.davidsuzuki.org/publications/downloads/2009/marine_ecosystems_report_web.pdf

Two mapping projects in British Columbia delivered on-line products in 2011:

Pacific North Coast Integrated Management Area Initiative. 2011. *Atlas of the Pacific North Coast Integrated Management Area. http://www.pncima.org/site/atlas.html.* This atlas was produced as a spatial reference document in support of planning processes associated with the PNCIMA Initiative. A total of 63 maps provide information on PNCIMA ecosystem, human impacts and uses, covering both sea and land applications.

British Columbia Marine Conservation Analysis. 2011: *Marine Atlas of Pacific Canada: a product of the British Columbia Marine Conservation analysis (BCMCA).* http://www.bcmca.ca/data/ This publication presents maps of aspects of British Columbia coastal waters on topics of oceanography, ecology, shipping, fishing, energy and tourism.

As well, annual reports of marine climate and life in British Columbia and neighboring waters are published by Fisheries and Oceans Canada. The most recent report is:

Crawford, W.R., and Irvine, J.R. (editors) 2011. State of physical, biological, and selected fishery resources of Pacific Canadian marine ecosystems in 2010. *DFO Canadian Science Advisory Secretariat Research Document 2011-054* http://www.pac.dfo-mpo.gc.ca/science/psarc-ceesp/osrs/index-eng.htm.

Review Comments on Working Papers 2011/P51 and P58 and also some comments in IA maps in Jamieson and Clarke 2006

Linda Nichol
Cetacean Research Program
Conservation Biology
Pacific Biological Station
February 5, 2012

Phase I 2011 – identifying IAs in Strait of Georgia and west coast Vancouver Island including the Strait of Juan de Fuca.

The following review of IA maps and sections.
Section 4.3.1
Two statements about cetaceans are perhaps misleading. It is an over generalization to say that cetaceans - across all groups aggregate to breed and disperse to feed. It is also incorrect to say that most species calve at lower latitudes and mostly use BC to feed. Killer whales, porpoises, dolphins and even some of the baleen whales are or may be resident year round and not migratory. I think both of these sentences could just be deleted.

- on all the maps – "town" should be replaced with "community"
Map 2. Harbour porpoise

Paragraph 1 – Anna Hall's Ph.D. thesis should be available now

Paragraph 2 of the harbour porpoise section describes an area from the south end of Saltspring to South Pender and south to northern tip of Sidney Island – which appears to be missing on the map

Race Rocks to Otter Point and out to 120m depth – on map looks like it goes to border – should clarify which it is – or how distance from shore/depth boundary was identified throughout for this species

Clayoquot Sound – would it be appropriate to clarify in the text how boundaries were determined. Also was BCCSN data consulted to determine if there are any other spots like this?

Map 3 Killer Whales

Resident killer whale IA should extend further out to include Swiftsure bank – see map

Map 4 Blue Fin Sei and Sperm whales

This looks OK for these species. Although I would like to know how the "ranking" was determined and then how it is later reflected in the EBSAs.

Map 5 Grey whale
– Note species should be spelled Grey not Gray
Habitat areas look good but we would like to see all the areas identified as red+green – that is all those nearshore areas are IAs for northbound migratory grey whales and summer residents. Text and on map should clarify this is northward migration and more clearly indicate the southward migration corridor is not well known – i.e. in terms of mapping it along west coast of Vancouver Island.

Map 6 Humpback whale

Text should clarify that while we know whaling occurred in the Strait of Georgia there are no whaling records from that era with which to identify even historical IAs in the Strait. This is because historical whaling data is used to inform IAs for other large whale species and humpback whale IAs on the west coast of Vancouver Island and PNCIMA.

We would like to see the humpback whale IA off WCVI extend to the western extent of the study area – i.e. to include the shelf break.

Map 7. Harbour seals

Text is a bit confusing. Are large haul out sites equivalent to important all out sites? If so clarify. Also a bit unclear do 10% of haulouts in WCVI equals 27 sites and that numbers wise this accounts for 48% of harbour seals on WCVI. So 10% of haulouts account for 48% of population?. What was the ecological rationale for a 10km buffer around haulouts and why were these harbour seal IAs ranked moderate?

Map 8 Steller sea lions. Steller <u>not</u> Stellar

Seems OK but what is the ecological basis for a 17km buffer. Also note this is a different buffer size than that used at the PNCIMA sites.

Map 9. Northern Fur Seal

I think this is OK, it is an area Peter has identified from the Pelagic research records from the 50s and 60s. So like much of the large whale IAs is based to some extent on historical data but is probably reasonable. Note in text about wintering females feeding on herring - should clarify that historical data indicate that fur seals were wintering there and feeding on herring. – no one has been out to look recently. Again why is this ranked high? I am not questioning the ranking but it would be helpful to understand the rationale for each of these species.

Map 10 Sea otters

Map looks OK it is up to date as of 2008. Currently a raft of sea otters has been observed wintering as far south as Amphitrite Point. So you should clarify that the "current" range as mapped, as the IA, is the range of occupation by rafts of sea otters up to 2008 and you should reference Nichol et al 2009 throughout and not Recovery Team – just a better reference.

Marine Mammals that are in the text but for which no IAs were identified. These were Dall's porpoise and Pacific white-sided dolphins, Transient killer whales and Offshore killer whales, Right whale and California sea lions. The text needs to clarify why these species do not have IAs identified. Is it because we do not have enough information and do not understand their habitat requirements or is it because they do not have any habitat that is considered to be more important than any other – or is this even ecologically possible? Anyway it should be clarified. Or perhaps leave out species for which no IAs were identified and define at the beginning of the report the criteria used to include species – this may be true for all taxa.

Further comments on the Phase 1 2011 wp

4.10 Oceanographic features
I was surprised to see that the shelf off WCVI was not included because the oceanographic areas seem to become a significant driving force in the identification of EBSAs in Phase II.

Figure 4 shows a lot of IAs that are subsequently excluded. So most of sea otter habitat , grey whale feeding and migratory habitat do not make it into an EBSA. I also found Figure 2 and 3 showed a striking lack of IAs in the Strait of Georgia – which seems in stark contrast to the amount of research attention being paid recently. I think this needs to be addressed more directly in the report.

6.4 Bias

I understand broadly the intent of this section but I think it should be clarified as to what is meant "important ecologically in the habitats they occupy" And it might be better to state that in many cases IAs capture areas of importance for some but not all life stages of a species – so that in fact these EBSAs may not be adequately identifying the most sensitive ecosystem areas. I don't think it is true that charismatic species like marine mammals get the research attention – (I suggest we know a lot more about salmon and sessile nearshore invertebrate species than many marine mammals), however certainly there is often additional (though not unbiased) information that the public may contribute in the form of sightings and stranding information.

Phase II 2011 WP

Section 3.0

I am concerned about the lack of EBSAs along the west coast of Vancouver Island. Without EBSAs along the continental shelf, sea otters, and most of the grey whale feeding and migratory habitat is left out. Again I do not understand the rationale, it would seem that oceanographic features were selected and not habitats and species that may be influenced by coastal processes?

The Strait of Georgia seems to be of little ecological significance – so little area identified as EBSA. This seems to be in striking contrast to the attention the area has received through things like the ERI?

Section 4.0

Table 1 – for Cetaceans – the "Why" column – "where most sightings have been observed" I am not sure what this really means as a EBSA criteria?

Table 2. Steller sea lions – Barrier Islands and Perez Rocks are on Vancouver Island coast so not in the Shelf Break area, so I am not sure how these have been included.

Table 3. No reason given for SRKWs

Section 7.2

Sea otter habitat is also part of the Scott Islands and should be reported here

Section 7.4

Sea otters should also be mentioned with respect to this EBSA extra – Aristizabal Island.

Nichol et al. (2009) show habitat relevant to section 7.2 and 7.4

References to consider citing for sea otters in stead of Recovery Team:

Nichol, L.M.,Boogaards, M.D., Abernethy, R. 2009. Recent trends in the abundance and distribution of sea otters (*Enhydra lutris*) in British Columbia. DFO Can. Sci. Advis. Sec. Res. Doc. 2009/016. iv + 16 p.

Nichol, L.M., J.C. Watson, G.E. Ellis and J.K.B. Ford. 2005. An assessment of abundance and growth of the sea otter (*Enhydra lutris*) population in British Columbia. Canadian Science Advisory Secretariat, Research Document #094, Fisheries and Oceans Canada. 27 pp.

A few comments on Maps in Clarke and Jamieson (2006) phase 1

Northern Resident killer whales: should be ranked high (red between Dixon Entrance and northern mainland

Grey Whales: a significant change is required here. Very recent work with tagged animals and shore based dedicated survey indicates unequivocally that grey whales when migrating north turn northeast into Queen Charlotte Sound and Hecate Strait and migrate up the eastern side of the basin. They do not appear to migrate northward along the west coast of Haida Gwaii as has been always thoughts/assumed. So the Grey Whale IA map needs to be changed to reflect this. This is very recent information that was no available at the time when information was being collected by the Delphic approach for this species prior to 2006.

Upon their southward migration it appears they do remain offshore and so the outside of Haida Gwaii could be maintained at a moderate ranking for that.

I will bring whatever other comments I have about the maps that John Ford and I examined last week.

Reviewer: Lisa Spaven*
*Note from editors: comments in margins are original comments from the reviewer.

Clarke and Jamieson PNCIMA EBSA 2006 Phase 1
Page 25-26

5.9 Turtles
There are three species of sea turtle known to seasonally inhabit British Columbia waters: Leatherback sea turtle, green sea turtle, and Olive Ridley sea turtle. Only the North Pacific population of the leatherback turtle (*Dermochelys coriacea*) is listed as endangered by COSEWIC and SARA for Pacific Canadian waters.

Leatherback sea turtle breeding and nesting occur in southern latitudes and animals migrate to northern Pacific latitudes to feed on jellyfish and other gelatinous prey (Pacific Leatherback Turtle Recovery Team, 2006). Abundance and spatial distribution of leatherback turtles in B.C. waters is unclear as sighting reports remain few (n=119 from 1931 to 2009) (Spaven et al., 2009) and distributional data on their main prey species (primarily large semaestome jellyfish) is sparse (L. Spaven, DFO, Nanaimo, pers. comm.). Seasonally, the majority of leatherback turtles are sighted from June through September throughout the Region, and have most frequently been sighted in waters off western Vancouver Island and Haida Gwaii (Spaven et al., 2009). 52% of sightings (n=63) have occurred within PCNIMA boundaries. Most leatherbacks appear to be adults (L. Spaven, DFO, Nanaimo, pers. comm.). Little is understood about the spatial distribution of juveniles and young adults and it is unknown whether they too migrate as far north as B.C. (Pacific Leatherback Turtle Recovery Team, 2006).

Sightings data for leatherback turtles have been collected by DFO in partnership with the Cetacean Sightings Network (BCCSN) at the Vancouver Aquarium over the past several years.. Most leatherback turtle occurrence in B.C., and elsewhere off western United States, are consistent with warm sea temperatures on the continental shelf along with areas of upwelling and high productivity (Spaven et al., 2009; Benson et al., 2007; Lutcavage and Lutz 1986; Shoop and Kenney 1992 as cited in the Pacific Leatherback Turtle Recovery Team 2006). A large IA was suggested that includes areas where turtles have been repeatedly sighted (N. Pinnell, VAMSC, Vancouver; L. Spaven, DFO, Nanaimo, pers. comm.) (Map 37). This area was ranked high for Uniqueness and Fitness Consequences. The use of other areas by this species is unclear and the importance of such areas to turtles should not be disregarded. Turtles have also been sighted at lower frequency in other locations within PNCIMA. Surveys and sightings solicitation from the public are ongoing in hopes of filling some of the knowledge gaps for this species. Prey-based modelling studies, currently underway, and habitat classification may yield better data on which to base IA identification for turtles.

Green sea turtles are most commonly seen in southern temperate waters around Mexico and Hawaii, but some may occasionally follow warm currents northward and end up in BC or even Alaska waters (Wild Whales, BCCSN 2009). There have been 34 reports of green turtles in BC, (BC Cetacean Sightings Network 2012). No particular areas can be identified as important at this time for green sea turtles.

Olive Ridley sea turtles have seen in Washington and Alaska waters, but not confirmed in BC waters until 2011, when one was found live stranded in Pacific Rim National Park Reserve on the Westcoast of Vancouver Island. There are 39 records of unidentified sea turtle from 1965-2012 (BC Cetacean Sightings Network, 2012), that may well have been green or Olive Ridely sea turtles, but this cannot be confirmed. Olive Ridely turtles nest on the beaches of Mexico and Central America and are more typically seen as far north as central California. No particular areas can be indentified as important for Olive Ridely sea turtles at this time.

Clarke and Jamieson PNCIMA EBSA 2006 Phase 2
Page 7-8

7. Shelf Break
Biophysical Description (Fig. 2G): The Shelf Break EBSA runs the length of the continental shelf in PNCIMA and includes the canyons/troughs of Queen Charlotte Sound. This area is known for its high aggregation of macrozooplankton (D. Mackas, DFO, Sidney, pers. comm.).

Biological significance: (Uniqueness, Aggregation)

m) Although several leatherback turtle sightings are reported annually it remains difficult to draw any conclusions about possible significant areas for this species (L. Spaven, DFO, pers. comm.). A large IA congruent with the Shelf Break EBSA was suggested that includes areas where turtles have been repeatedly sighted (N. Pinnell, VAMSC, Vancouver; L. Spaven, DFO, Nanaimo, pers. comm.).

Levesque and Jamieson 2001 Important Areas Strait of Georgia and Westcoast Vancouver Island
Page 46

4.9 TURTLES
Three species of sea turtles are observed in Pacific Canadian waters: the leatherback turtle (*Dermochelys coriacea*), the green sea turtle (*Chelonia mydas*) (Pacific Leatherback Turtle Recovery Team 2006), and the Olive Ridley sea turtle (L. Spaven pers. comm.).

The Pacific leatherback turtle is listed as endangered under the SARA and by the COSEWIC. Leatherbacks migrate from their nesting and breeding sites in tropical waters to temperature waters to feed and the majority are observed off the BC coast between July and September (Pacific Leatherback Turtle Recovery Team 2006). Sightings data are collected by the BC Cetacean Sightings Network (BCCSN), a collaboration between DFO, the Vancouver Aquarium Marine Science Centre, and the Government of Canada Habitat Stewardship Program for Species at Risk. There is limited data on feeding, but leatherbacks are known to target large scyphomedusae, such as moon jellies, sea nettles and lion's mane jellies (L. Spaven, DFO, Nanaimo, pers. comm.). Jellyfish contain high water content and a low nutritional value and thus leatherbacks must range widely to find their prey, which are often found along coastal upwelling areas and oceanic frontal systems (Lutcavage and Lutz 1986; Shoop and Kenney 1992 as cited in the Pacific Leatherback Turtle Recovery Team 2006). Sightings of leatherbacks are infrequent (2-3 per year on average) and widespread across the WCVI and PNCIMA. There have been 119 confirmed sightings recorded in Pacific Canadian waters from 1931 to 2009, most associated with continental shelf waters (Spaven et al., 2009). Of these, 50% (n=60) have been seen off WCVI, up inlets, and within Strait of Georgia and Juan de Fuca Strait. The whole WCVI was identified as an important foraging ground (L. Spaven, pers. comm.) as the turtle are most frequently seen over Continental shelf waters. The identified IA ranked moderately in Uniqueness, Aggregation and Fitness Consequences. There is little information known on the distribution of juveniles, and the extent of their range in temperate waters is not known (Pacific Leatherback Turtle Recovery Team 2006).

Green sea turtles are most commonly seen in southern temperate waters around Mexico and Hawaii, but some may occasionally follow warm currents northward and end up in BC or even Alaska waters (BCCSN 2009). There have been 34 sighting reports of green turtles in BC,

(BCCSN 2012). No particular areas can be identified as important at this time for green sea turtles.

Olive Ridley sea turtles have seen in Washington and Alaska waters, but not confirmed in BC waters until 2011, when one was found live stranded in Pacific Rim National Park Reserve on the Westcoast of Vancouver Island. There are 39 records of unidentified sea turtle from 1965-2012 (BCCSN 2012), that may well have been green or Olive Ridely sea turtles, but this cannot be confirmed. Olive Ridely turtles nest on the beaches of Mexico and Central America and are more typically seen as far north as central California. No particular areas can be indentified as important for Olive Ridely sea turtles at this time.

Comments on the information about Eulachon and sturgeons contained in four EBSA papers being reviewed by CSAP, 7-8 February 2012

by Chris Wood (4 Feb 2012)

I have organized my comments by species to facilitate comparison and consistency among the four reports.

Eulachon

Clarke and Jamieson (2006), both Phase I and Phase II reports:

1) The information in these reports was accurate and fairly complete at the time of publication, but circumstances have changed and considerable additional information has since become available in the following reports and citations therein:

- Beacham, T.D., D.E. Hay, K.D. Le. 2005. Population structure and stock identification of Eulachon (*Thaleichthys pacificus*), an anadromous smelt, in the Pacific Northwest. Marine Biotechnology 7:363-372.

- COSEWIC. 2011. COSEWIC assessment and status report on the Eulachon, Nass/Skeena Rivers population, Central Pacific Coast population and the Fraser River population *Thaleichthys pacificus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. Xv +88 pp. Available at: http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_eulachon_0911_eng.pdf

- Levesque, C., and T. Therriault. 2011. Information in support of a Recovery Potential Assessment of Eulachon *Thaleichthys pacificus* in Canada. Canadian Science Advisory Document 2011/nnn (*pending revision*)

- Schweigert, J., and 8 co-authors. 2012. Recovery Potential Assessment of Eulachon *Thaleichthys pacificus* in Canada. Canadian Science Advisory Document 2012/nnn (*pending revision*)

One significant change is that recent genetic analyses of population structure based on microsatellite DNA show greater genetic differentiation among spawning sites in different rivers than had previously been inferred from less polymorphic markers (Beacham et al. 2005). This differentiation is great enough to estimate stock composition of samples of juvenile Eulachon from trawl surveys, and such analyses have provided important information on differences in the marine distribution of Eulachon from major spawning populations (Beacham et al. 2005, updated in Schweigert et al. 2012).

2) Another significant change is that COSEWIC has recently assessed the status of Eulachon spawning populations in Canada (COSEWIC 2011). Using the genetic data on population structure together with other information on spawning time and demography, COSEWIC identified three separate designatable units (DU) based on guidelines that require evidence of both isolation and unique evolutionary significance. The Fraser River and Central Pacific Coast DUs of Eulachon have both been designated as 'Endangered'. The Nass/Skeena DU was initially designated as 'Threatened', but this status has since been rescinded pending reassessment with new information. Because each Designatable Unit is treated as a separate 'wildlife species' under the Species At Risk Act, this classification scheme may also have implications for the identification of IAs.

3) A minor inconsistency exists in the sentence on page 10 of the Phase I report which refers to **33** rivers in BC where Eulachon are known to spawn, of which **14** that are used regularly. These figures have been changed to '**at least 40**' and '**13**' in subsequent reports (e.g., Schweigert et al. 2012).

4) Map 4 on page 53 of the Phase II report shows only three marine areas with a 'moderate score' (yellow) for Eulachon. Although the scores for these areas are likely correct, catch per unit effort in research surveys (an index of the density of immature Eulachon) is as high or higher in some other areas of Hecate Strait and Queen Charlotte Sound (see maps in COSEWIC 2011 and Schweigert et al. 2012, and the map of important marine habitat in Levesque and Therriault 2011); these other areas of high CPUE are not scored as IA in the Phase II report.

Levesque and Jamieson (2011?), both Phase I and Phase II reports:

Comments (1) to (3) above all apply to these reports as well in the sense that some relevant information has been omitted. However, other than the minor discrepancy mentioned in comment (3), the text and map in these reports seem defensible to me.

Sturgeons

Clarke and Jamieson (2006), both Phase I and Phase II reports:

Text and map seems accurate and defensible to me.

Levesque and Jamieson (2011?), both Phase I and Phase II reports:

Text on page 15 refers to 'two populations' of Green Sturgeon that spawn in three rivers. It would be better to refer to four (extant) populations that spawn in different rivers (the Rogue, Klamath-Trinity, Eel, and Sacramento rivers) and to indicate that these populations have been grouped into two Evolutionarily Significant Units (ESUs, roughly equivalent to COSEWIC's DUs). The implication is that sturgeon spawning in the different rivers are likely reproductively isolated by homing (i.e., belong to demographically isolated populations), but that the populations in the Rogue, Klamath-Trinity, and Eel rivers are closely related and not considered evolutionarily distinct from one another (see Adams et al. 2007). The rest of the material on sturgeons (both species) seems accurate and defensible to me.

Reference: Adams, P., C. Grimes, J. Hightower, S. Lindley, M. Moser, and M. Parsley. 2007. Population status of North American green sturgeon *Acipenser medirostris*. Environmental Biology of Fishes 79:339–356.

Greg Workman
February 6th, 2011.

With respect to content I limited my technical review to the input data of the groundfish sections of all four documents, and provide a few comments of process and scale.

Clarke, C.L., and Jamieson, G.S. 2006a. Identification of ecologically and biologically significant areas in the Pacific North Coast Integrated Management Area: Phase I – dentification of important areas. Can. Tech. Rep. Fish. Aquat. Sci. 2678: 59 p.

Clarke, C.L., and Jamieson, G.S. 2006b. Identification of ecologically and biologically significant areas in the Pacific North Coast Integrated Management Area: Phase II – Final Report. Can. Tech. Rep. Fish. Aquat. Sci. 2686: v + 25 p.

Levesque, C. and Jamieson, G. Identification of ecologically and biologically significant areas in the Strait of Georgia and off the west coast of Vancouver Island: Phase I – Identification of Important Areas. CSAP Working Paper 2011/P51.

Levesque, C. and Jamieson, G. Identification of ecologically and biologically significant areas on the west coast of Vancouver Island and the Strait of Georgia, and in some nearshore areas on the North Coast: Phase II – Designation of EBSAs. CSAP Working Paper 2011/P58

I take no exception to the information presented for groundfish in Clark and Jamieson 2006 (Phase1), the distribution maps from the West Coast Offshore Oil exploration Panel still represents the most comprehensive overview of our knowledge of spawning, rearing and feeding areas for most groundfish species. The author's rightly point out that little work has been done over the last three decades to further our understanding of spawning areas or early life history requirements for most groundfish species, I would point out though that this is due to the overwhelming need for single species stock assessment or species at risk advice. That said we may be in the position now or in the near future to start mining our fisheries independent survey data base for information on the distribution on spawning and juvenile life history stages for many species. While this is beyond the scope of the current document it could be identified as a research need to help better resolve EBSAs at a finer spatial scale in the future (Also noted by Sinclair in one of these documents).

For the Clark and Jamieson 2006 Phase II report I have no comment beyond questioning the utility of designating the entire PNCIMA shelf break as an EBSA. From a groundfish perspective I'd say that roughly 60 – 80 % of groundfish fishing activity takes place on the shelf break, consequently it is already receiving a fairly high degree of management in the form of a multi-sectoral IFMP, enhanced monitoring using ASOP, EM, and DMP, and individual fisher accountability for all fishery induced mortality across all species. It would be helpful if the authors identified what additional management actions they believe are needed to better manage human activities in this proposed EBSA.

For Levesque and Jamieson 2011 – Phase I, I have few comments beyond updating the COSEWIC and SARA status for basking shark and several rockfish species and only a few editorial changes that I can talk to the authors about directly. These include sorting out the description of, and times frames for, groundfish synoptic surveys, clarifying the language around Pacific Cod stock structure and spawning areas in the Strait of Georgia (check Westrheim 1998) and the description of the young of the year lingcod trawl surveys. The information presented does represent our current knowledge on the important areas for groundfish. We know where adult life history stages are distributed from fishery data but have very limited information on

spawning and rearing areas, this is the same acknowledgment I made for the PNCIMA summaries and this emphasises the need to do some directed research using data we already have (perhaps the authors of this document could undertake the work). This information need is identified in recommendation 2 of section 7. I tend to agree with the four of the recommendations at the end of the report, in particular #4 which identifies the need for TEK and LEK and stakeholder consultation and involvement.

Clark and Jamieson - Phase II – follows the same process outlined for PNCIMA in which oceanographic process and geographic bottle necks are used to broadly identify EBSAs. As with the PNCIMA EBSAs spatial scale is an issue for me, more discrete units of both space and time would seem more reasonable but then again I don't know what's meant by the term "enhanced" management. Specific comments are limited, under section 4.3 Continental Shelf off of Barley Sound EBSA, I don't agree with the comment that the resident inshore Barkley Sound Hake stock makes use of the offshore LaPerouse, Finger or Swiftsure banks but will concede they may access and use Amphetrite Bank. I also found the shift from a tabular description of EBSA attributes to numbered bullets when switching to describing the updated PNCIMA EBSAs was awkward, I would prefer the authors stuck to the Tabular format.

A couple of general comments:

I am repeating myself here but I do wonder about the utility of such large scale EBSAs, the authors acknowledge that most if not all of our coastal waters are already managed to one degree or another, such large EBSAs may make it impossible for managers (FAM or Oceans) to operationalize these EBSAs in a meaningful way. Discrete area and time EBSAs can readily be incorporated into Integrated Fisheries Management Plans, i.e. closing shallow waters in the spring to protect Lingcod nest guarding, Pacific Cod spawning closure, closure of partruiting areas for rockfish such as the mouth of Goose Island Gully or the soft shell closures for crab in Hecate Strait. These are management actions that respond to an identified need for management or conservation due to single or sometimes multiple species biological requirements. While I do not ague with the intent here greater spatial and temporal resolution would make them more usefull to managers I think (I'm probably wrong though)

Another general statement concerns the process and the likely failure of this process to get any traction with stake holders due to the lack of consultation and the absence of TEK or LEK in the inputs. Granted the authors did acknowledge this shortcoming. I believe though that to achieve any tangible buy in by fishermen, first nations, sport fishers, ecotourism companies or NGOs or FAM the authors should have consulted these folks at the outset. I fear this initiative will loose all relevance and credibility for stakeholders given the lack of consultation and worry that when FAM or Oceans managers have to take this document out to consult they will be burned at the stake or worse, ignored.